OUISIANA CONSERVATION REVIEW

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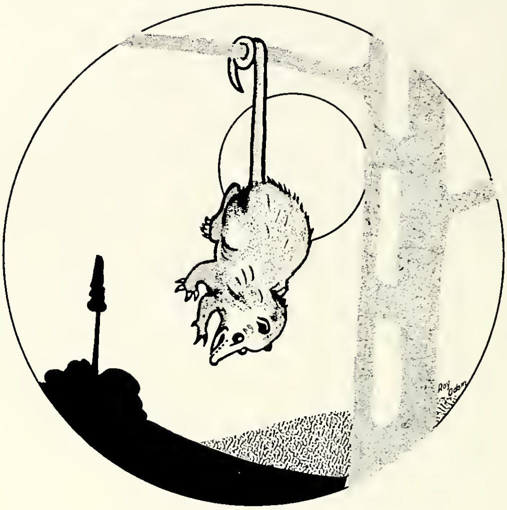
ARTMENT OF CONSERVATION, STATE OF LOUISIANA • WINTER, 1939-40



If you could hang by your tail, like Mr. Opossum, it would simplify matters considerably.

It would give you a different outlook on life. No complexes—no inhibitions—no astronomical surmises.

Civilization imposes grave responsibilities on all of us. We cannot escape these responsibilities by hanging by the tail, mentally, if not literally.

One of these responsibilities is the conservation of our wildlife and natural resources. We learn by bitter experience and gradually perfect the technique that is essential in the prevention of waste and dissipation.

It will not suffice to preserve our wildlife sanctuaries, our fish and game refuges, our forest preserves, for the benefit of posterity. We should develop our natural resources so that they will contribute more and more to the superior life of a greater proportion of those who live in the present generation.

We may emulate Mr. Opossum and hang by the tail, but comes the time when the tree disappears and with it the limb—what then?

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CLOSE-UP OF A CONTEMPORARY DECORATES OUR FRONT COVER

■ Only North American representative of the marsupials, those strange animals remarkable for carrying their young in a peculiar pouch, the opossum has won, in spite of its stupidity, a colorful place in southern folklore. About one hundred and twenty-five thousand Louisiana 'possums annually contribute their skins to the fur markets of the world. The young after six or eight weeks climb over the mother's fur and often present the curious spectacle of some half-dozen or more little 'possums riding in state on their mother's back.

What Conservation Really Means

By

Ernest S. Clements

Commissioner,
Department of Conservation

" . . . . ideal background for an experiment in social science."

I suppose most people have a rather vague idea as to what conservation means and I must confess that I was in that class myself until I was able to translate the word in terms of human relations and social welfare.

Of course we all know that conservation means to conserve, to preserve for the benefit of future generations—but have we given much thought as to how the future generations may benefit from what we have to conserve?

When we think of our wildlife we naturally think of our sportsmen, our hunters and fishermen, and it is true that these sportsmen derive a genuine benefit and keen satisfaction from our efforts to conserve the natural habitat of our wildlife.

But I am now thinking of conservation in its broadest concept, not just the conservation of our natural resources but the conservation of those human values that contribute to the maintenance and preservation of our organized society. I am thinking of those embryonic members of society, young boys and girls in the formative period of life, and what we may do to conserve their character, make them worth-while citizens of the State.

This brings us directly to a program of conservation that I have had in mind for some time. We are told that the crime bill of our country now reaches the staggering total of fifteen billion dollars annually. We may be sure that Louisiana bears its share of this toll, amounting to several hundred million dollars annually, and it would appear that any measures that might tend to prevent or reduce this enormous cost would be justified in the eyes of society.

Now here in Louisiana we are particularly fortunate in having an ideal background for an experiment in social science that might concsivably prove to be the turning point in holding back the crime wave now sweeping our country. We have the climate for an outdoor life the year 'round—we now have dedicated as state and national parks, fish and game preserves and other recreational grounds more than 700,000 acres of our State.

In other words we have the background for wholesome outdoor life and diversion; our problem is to bring our boys and girls in direct contact with this outdoor life, especially the youth of our urban centers that offer many temptations during those formative years when the character pattern is being moulded and influenced to such an important degree.

We must have a practical program that will stand up under the criticism that it is a dreamer's project, Utopia of the altruist. We have all witnessed the wonderful accomplishments of the Civilian Conservation Corps, but as I see it the youngsters should be taken in hand at an earlier and more impressionistic age, the chances for inculcating ethical and moral standards being more apt to bear fruit in the age groups from ten to seventeen than in later years.

Be that as it may, I am not unaware of the far-reaching service and influence of our Boy and Girl Scouts and other organizations that instill high principles and standards in the youth of our nation. But I have in mind particularly those of our boys and girls from under-privileged families in the lowest economic groups, who furnish the preponderance of our criminal class, not because they are by nature any worse than the more fortunate members of society, but because they are subject to greater economic stresses and temptations, because they may not have the advantage of favorable educational and environmental influences.

Suppose we select boys and girls of this class as the nucleus of our social experiment. Say on Fridays and Saturdays, at the close of the school week, we send these boys and girls into the country, on camping expeditions, to study Nature at first-hand, to learn woodcraft, etc, but principally to inspire in them a love of outdoor life and remove them from the temptations of our urban centers.

It would be a disciplinary process but not militarism or regimentation—possibly not more than ten in a group, under the leadership of a director or councillor. Certain hours might be devoted to the study of outdoor subjects, the remainder of the time to recreation, to fishing, swimming and other outdoor sports.

Now what would happen if such a program were left to the voluntary support of the class that it is designed to reach? Surely it would fail for lack of sufficient co-operation on the part of the elders of the family. There must be some incentive or stimulus to the support of our project. The chances are that each of these youngsters has some productive or earning capacity that contributes to the upkeep of the family. Such a program would mean a financial sacrifice on the part of the family—but however valuable this boy or girl may be to the family he or she is worth even more as an asset of society and the State.

This suggests that we must have some form of subsidy, some basis of compensation to the family for the time during which it is deprived of the earnings of this boy or girl. It might seem that any father or mother would rejoice at an opportunity or privilege of this kind for the younger members of the family, but we must bear in mind that we are dealing with a group whose income is barely sufficient to keep the wolf from the door, where every penny counts.

We think nothing of investing millions in hard-surfaced roads for our speeding automobiles, in brick and mortar for our magnificent schools, hospitals and other public buildings. The difference is that the physical construction deteriorates, the boy's character endures. Why not an investment in those imponderables that go to build a decent law-abiding citizenry?

How are we to finance such an undertaking? Where is the money to come from? Well, that gets us back to conservation. Nature gives us the answer. Nature has been kind to Louisiana and I believe that in the years to come we will receive a larger and larger income from our rich petroleum reserves, that the increasing demands of the automotive industry will keep pace with our production. In what better way can we invest the returns from these natural resources than in the conservation of our youth so that the future of our State may be erected on a solid foundation?

I would not venture to predict to what extent such a program would be effective. The relative value of heredity and environment is still a disputed question. The most favorable environment may not suffice to counteract generations of degenerative tendencies. But personally I feel that the proper influences and guidance in these impressionistic years, in the wholesome atmosphere and surroundings of an outdoor life, would work miracles in moulding a correct pattern of life for these future citizens. If it is true that crime is now costing the State several hundred million dollars annually, then this million or so that we spend in crime prevention will be money well spent, call it insurance against crime or what you will.

Some sort of training school for the leaders or councillors would be required—these are details that would have to be carefully studied, of course.

Each of these boys and girls would cost the State approximately $1,000 over a five-year period; but if we succeed in converting a potential criminal into a useful member of society who will quibble over the cost? If the earning capacity of the average worker is $1200 per year, these human products of our experiment, over a period of forty years, will earn and spend an average of $50,000, distributed throughout the arteries of community trade. Can you conceive of any other investment that would yield such returns to the State?

I am not looking beyond the boundaries of our own State. Louisiana is singularly blessed by Nature with the background for such an experiment. But if this program were extended to other states it is conceivable that it might remove half a million boys and girls from the crime market, give them the guidance and inspiration of influences that would tend to offset some of the vicious tendencies of our day—who can estimate the value of such a factor in the future of our national life?

I earnestly commend this program to the consideration of the citizens of Louisiana.

Conservation Department Objectives Outlined by Commissioner Clements

The annual propagation of 40,000 quail for release to Louisiana landowners—the annual rescue or recovery of 40,000,000 to 50,000,000 game fish of all species from the barrow pits along the rivers for distribution to Louisiana fishing waters—these are among the objectives of Conservation Commissioner Ernest S. Clements.

Said Mr. Clements:

"Take our quail hatcheries, for example. We have a nucleus of about 600 quail, but we should be producing at least thirty or forty thousand birds every year for release all over the State. Heretofore our hatcheries have been largely employed in experimental work, but I don't think it would cost a great deal to operate them on a much larger scale.

"The size of the birds is important. We have conducted experiments along this line—whereas the quail weighs only seven or eight ounces, on the average, the chuga weighs up to 21 ounces. It is also necessary to produce a bird that can be flushed from cover, some species being unsatisfactory in this respect.

"If we get the co-operation of our landowners in providing food and cover for our birds, especially in the prevention of fires that destroy the underbrush, we will soon have an adequate supply for our small game hunters.

"I am also investigating the possibilities of wild turkey propagation. If it is feasible we should make every effort to replenish our depleted stock, so that we can have an open season for turkey hunting, which used to be so popular with our sportsmen.

"Recently I have become interested in the rescue of fish from the multitude of barrow pits which you find beside our rivers, for distribution in the lakes and streams and other fishing waters of our State. These fish have been brought down by flood waters from the vast territory that is drained by the Mississippi, Red and other rivers that deposit in this State. They comprise practically every known specie of game fish. Of course it is necessary to study the waters in which they are to be placed, to insure the proper habitat and character of food for each of the varied species, but we have made some progress in this direction. In the past three or four months we have rescued approximately one and a half million fish from these barrow pits. I should say it will be possible to push this to forty or fifty million yearly, which will help to take care of our increasing army of fishermen.

"We not only have to consider the needs of our own fishermen and anglers—we may as well anticipate a big increase in the number of our out-of-state visitors. This tourist crop is to-day one of the most valuable crops of the United States and with the great improvement in our own highway system it is now headed in this direction.

"A very large proportion of these visitors are either hunters or fishermen. I don't suppose there is any state in the Union that offers such a variety of hunting and fishing grounds as Louisiana. Of the 32,000,000 acres in our State we have 2,000,000 acres under water, covered by lakes, rivers, bayous, canals and other bodies of water which provide an abundance and variety of fish to be found nowhere else on the American continent.

"As this attraction is more widely publicized we may expect an accelerated swell of the tourist trade, which will contribute to the continued prosperity of our own people.

"I am in favor of a very strict enforcement of our conservation laws, but I hope the sportsmen of our State, big and little, will soon begin to realize that I am in complete sympathy and accord with some of their aims, that I am anxious to cooperate with them in improving the conditions that affect their sport. I know that in the case of the pollution of our fishing waters our engineers and chemists are doing everything possible to solve a difficult problem and I believe our efforts are appreciated by the sportsmen of those localities where this condition is most aggravating.

"I have nothing against the rich man whose fortune has been built on his individual ability and industry, but I would like to see a more equitable distribution of those benefits which we have inherited from our forebears, those resources which Nature has bestowed on our State in such generous measure. I have reduced the toll for hunting on the public hunting grounds at Pass a Loutre from $15 to $5, and I would like to see our sportsmen of moderate means take advantage of our facilities there during the duck hunting season.

"It may be that we are too close to the picture for the proper perspective. If we stand too near the details are vague and blurred, but if we stand at a distance the figures assume their correct proportions. Personally, I am just as much interested in some of the social aspects of conservation as I am in the preservation of our wildlife. That is, I would like to see more of our people participate in the healthy benefits of outdoor life, and I feel that our future program of work should be carefully studied and planned with this in mind.

"At the beginning of each year most of us are accustomed to take stock of our assets and liabilities. I feel that the same evaluation should be employed in our conservation work. Let us take stock of our natural resources. Let us see how they may not only be conserved for the benefit of future generations, but how they may contribute to the happiness and well-being, the superior life of a greater proportion of our present generation."

Wildfowl Sneer At Huntsmen Near

Birds sometimes can be as exasperating as humans, it is indicated in a report on a mean streak of humor discovered by naturalists in the National Park Service.

"While perspiring nimrods were beating the canyons and cornfields in the immediate vicinity of Scotts Bluff National Monument, Nebr., during the hunting season, in vain quest of game, numbers of pheasants were observed strutting primly about inside the area. They were in plain sight of the hunters, but acted as if aware that the monument was a sanctuary. Ducks and geese also sought refuge in the same manner," it was declared.

No mention was made of the comments by the hunters concerning these supercilious beneficiaries of national conservation.

* * *

Watermeal, the smallest known flowering plant in the world, which measures only about one thirty-second of an inch in diameter, is one of the more than 200 food items eaten by game ducks in the United States and Canada, according to the Bureau of Biological Survey.

An Oyster's Lot Is Not a Happy One, Revealed

Many things besides a noisy noise annoy an oyster, the Bureau of Fisheries has found in the course of its scientific investigations under the national conservation program. They have a host of enemies, some of whom, armed with drills, suction pumps, crushers, and other paraphernalia provided by nature, make life miserable, if not impossible, for the harassed bivalve.

A type of snail, for instance, drills a hole through the oyster's shell with its rasplike tongue, inserts its snout into the hole and devours the oyster meat; the black drumfish crushes the oyster shell between the bony plates in the back of its mouth, like stone crushers, and takes its fill; starfish around Long Island Sound squeeze the shellfish with suction equipment and inject a fluid which "dopes" the poor bivalve before feeding on the hapless oyster.

Water From Rock Makes Stockmen Talk of Feat

Success of Grazing Service CCC forces in extracting water from a rock near Blanding, Utah, recently brought comments from local stockmen concerning the "modern miracles" performed under the national conservation program, according to reports from Regional Grazier C. P. Seeley, at Salt Lake City.

Describing completion of the Joshua Spring project, Mr. Seeley said:

"This project was commenced with only a wet spot visible. Stockmen advised that no water could be obtained there because in 50 years of running stock on that range they had never known a cow to get a drink there. However, after drilling into the rock it was noticed the water was escaping through fissures. These fissures were cemented and the water piped to a tank which holds 6,242 gallons.

Fishing Areas Set Aside For Women In Some States

Whether Lady Luck is more partial to women than men is an interesting question raised by surveys of the Bureau of Fisheries which indicate that several of the States have reserved streams and ponds for the exclusive use of lady anglers.

Without endeavoring to decide the relative potency of the male and female brand of fishermen's luck, the Bureau has assembled the information as an interesting and important branch of its research into the sports and commercial fisheries problem involved in the national conservation program.

Both North Carolina and Georgia have set aside streams for the use of the ladies, while Wisconsin has reserved several ponds in which children may fish without competition from their elders.

Sportsmen's organizations in Pennsylvania likewise have had fishing areas set aside for the women and children, one of the women's fishing spots being located at Spring Creek, near Bellefonte.

Connecticut, however, furnishes the most de luxe service for female anglers, according to the survey. In that State not only are ponds and streams reserved for the women and children, but a lady fish warden is employed to instruct them in the proper procedure and fishing lore, including, presumably, the art of baiting a hook and removing the catch without the accompaniment of shrill squeals of excitement.

"MONUMENTS" VARY IN SIGNIFICANCE

"Monument", in the sense employed by the National Park Service, is believed to have first received that interpretation by Baron von Humboldt (Alexander), the famous explorer and scientist. In describing certain natural features in Brazil, he refers to them as "Monuments de la nature" or "Natural Monuments." At the present date 78 such areas are classified as national monuments in the national park system. A large proportion, however, notably the Southwestern Monuments, are distinctly prehistoric in their significance; others, like Fort Laramie, Wyoming, Scotts Bluff, Nebraska, and Fort Marion, Florida, commemorate events or periods in our nation's history.

* * *

Of the Louisiana fresh water fisheries, the frog is leader in commercial value. Spearing or shooting of frogs is prohibited by law, while jacklights and the use of mechanical frog catchers which do not puncture the skin of the frog are permitted. Salt water shrimp production leads in value of the salt water fisheries.

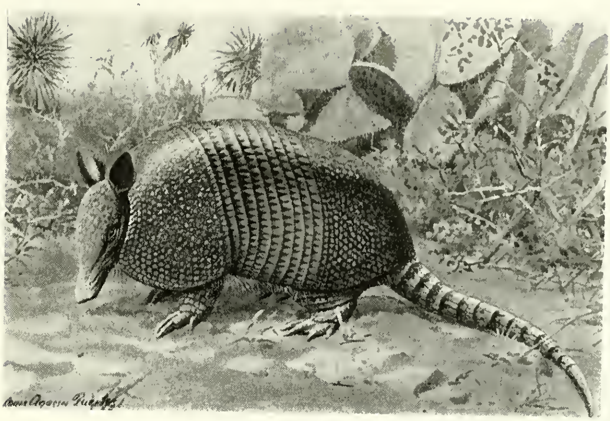
* * *

Nearly 200 species of lichens have been identified in Great Smoky Mountains National Park by the eminent authority on these plants, Dr. Gunnar Degelius, of the University of Upsala, Sweden.

* * *

Wildlife in Yosemite National Park, Calif., seems to be casting envious eyes on the Dionne quintuplets. A mother bear in that area paraded a litter of four cubs this year, one of the few recorded cases known of four cubs at one birth.

Armadillos Invading Louisiana are not Quail Enemies



■ **The Texas Nine-banded Armadillo, one of North America's strangest land mammals, now becoming numerous in Louisiana.**

One of the strangest of all North American land mammals, the Texas Nine-banded Armadillo (*Dasypus novemcinctus texanus* Bailey) is becoming a widely distributed and common animal in much of Louisiana. It is spreading steadily eastward and northward.

Numerous inquiries and expressions of misgiving regarding it have been received by the Department of Conservation from Louisiana sportsmen who fear that it may be an agent in destroying quail nests and eggs.

Commissioner Ernest S. Clements therefore instructed James Nelson Gowanloch, Chief Biologist of the Department, to investigate the relation of armadillos to quail. Inquiries pursued in the field disclosed wide differences in opinion on the part of Louisiana hunters, some of whom believed the armadillo to be a serious quail pest while others thought that quail scarcity due to other causes simply happened to coincide with the appearance of the armadillo.

Investigation of all available data regarding the armadillo establishes beyond reasonable doubt that armadillos are beneficial rather than injurious to quail. Much of the supposed armadillo damage to quail nests and eggs is the work of the cotton rat (*Sigmodon hispidus hispidus* Say and Ord), one of the most abundant rodent pests on Louisiana farm lands. Intermediate in size between the house mouse and an ordinary rat, cotton rats are exceptionally vicious and destructive. Sportsmen finding a raided quail nest, and perhaps seeing in the same afternoon an armadillo nearby, wrongly conclude that the latter destroyed the game bird's eggs.

Armadillos have a peculiar appearance and structure. Belonging to the same group as the anteaters, they possess peculiar teeth, having a total of 28 or 32 molars while incisors, canines and pre-molars are all alike missing. The body is covered with a bony, jointed shell, while the head, feet and tail are also covered with a scale-like armor. Well equipped for digging, armadillos burrow rapidly in even hard soil. Highly esteemed as food, the armadillo is usually barbecued with a rich sauce.

Armadillos occur only in the New World where they find their center of abundance in South America. Gigantic prehistoric species once roamed the pampas of Patagonia and suggested, in their armor, modern military tanks. All surviving armadillos are small.

LEVEES GOOD HABITATS

Armadillos have been invading Louisiana from Texas for at least the last ten years and had apparently succeeded in crossing the Mississippi even before the construction of bridges over that river. Recently they have become more and more numerous, the increase being probably due to the construction of levees in flood control work. Armadillos, unable to penetrate normal swamp areas readily, find the levees easy avenues for wandering and good habitats for existence.

One farmer near Oakdale shot three armadillos during a single squirrel hunt, while in another neighboring farm dogs killed seven in two weeks. A hunter near Oakdale brought in as his afternoon's quarry two quail, two rabbits and four armadillos. Armadillos are present as far north as Alexandria, Bunkie, Cottonport and Tallulah.

George H. Lowery, Jr., states (A Preliminary Report on the Distribution of Mammals of Louisiana, Proc. La. Acad. Sc., Mar. 1936, III, 1) that on two fox hunts north of Lake Charles four armadillos were taken the first night, seven the second. He states: "Even the best hounds hate the scent of an armadillo to such an extent that they quit a 'hot trail' without reluctance when it is crossed up by one of these animals."

It is interesting to note that William J. Tucker, executive secretary of the Texas Game, Fish and Oyster Commission, thirteen years ago made a definite prediction that the armadillo would extend its range eastward and northward.

A study of the food of the armadillo shows that 85 per cent is composed of insects, including the sugarcane borer and the minute, yellowish fire ant. Fire ants, serious quail enemies because of their destruction of quail chicks inside the pipped eggs, appear to be a favorite food. *Solenopsis gemeiata* and *Solenopsis molesta* are two southern species of fire ant.

Tucker reports (in correspondence) that scorpions, tarantulas and even small snakes and their eggs are eaten. Phil Goodwin, Director of Texas Wildlife Restoration, states (in correspondence) that on one occasion he observed an armadillo pursuing grasshopers in an open, grassy, fallow field during broad daylight. Lehmann and Kalmbach found their feeding activities centered chiefly in the search for ant larvae ("ant eggs").

Clarence Cottam of the Bureau of Biological Survey, Washington, D. C., notes (in correspondence) that the armadillo occasionally takes some plant food. He concludes: "The best method to control this species is the use of hunting with dogs. This is a practice that will permit the removal of resident armadillos if followed for a period of time. Such hunting usually involves the digging out of the animals after they have entered some burrow or den.

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The Creole Field Off-Shore, Cameron Parish, Louisiana

By

H. A. Metzger

■ **Drilling rig on Well No. 10, Superior and Pure Oil Co., Creole field, Cameron Parish, La.**

The field is located in the area of Township 15 South, Range 8 West, 8 miles east and 2½ miles south of the town of Cameron. This places the field approximately a mile and a quarter off the Cameron coast in the Gulf of Mexico.

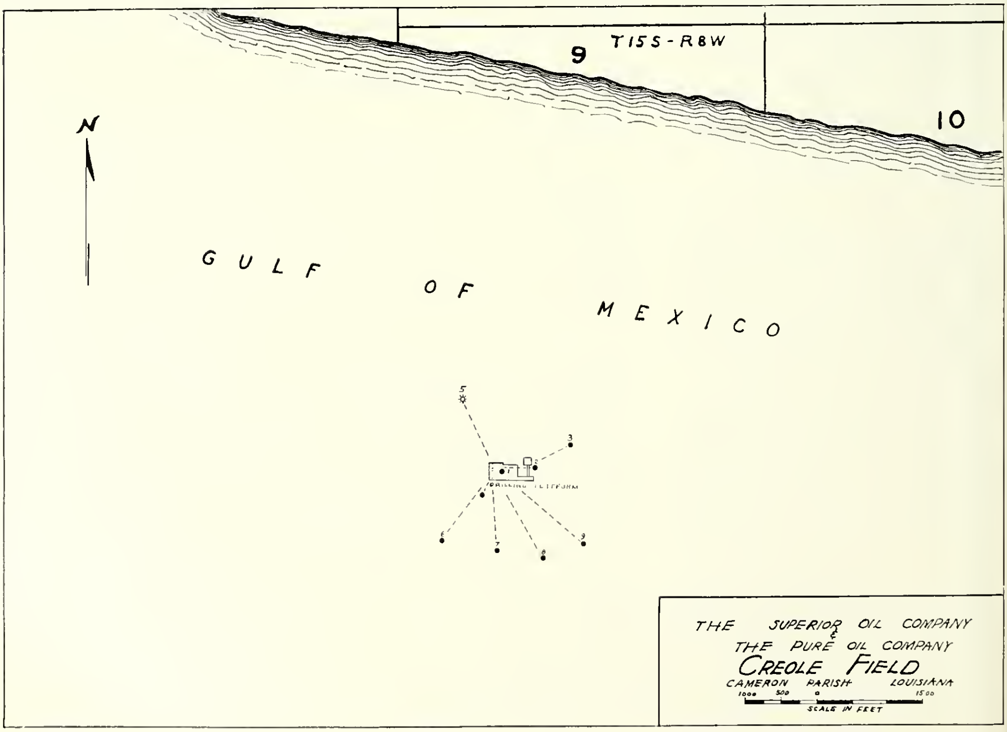
This field is the first field to be discovered out in the open waters of the Gulf of Mexico. The field was discovered by reflection seismograph in July and August, 1934, by the Pure Oil Company. The discovery well was drilled by joint operations of the Pure Oil Company and The Superior Oil Company and was completed March 11th, 1938 with an initial flow of 200 barrels of oil daily. The producing zone in this well is from 5110-5130′. This well was originally drilled to 9394′ but was plugged back to the above mentioned depth. The type structure is a deep seated dome. The elevation is sea level.

At the present time there are 9 wells in the field. Of this number, 8 are producing oil wells and State Gulf of Mexico # 5 is a gas well which is now shut in.

The producing formations of which there are three are all Miocene sands. The first zone is between 5100 and 5200′; the second is from 6700-6850′; and the third is from 6900-7000′.

The approximate cost of building the platforms from which all 9 of these wells were drilled and the cost of drilling these wells was approximately $850,000. The production through December 1939 approximates 725,000 barrels. The gravity range of the oil is from 33.4 to 36.5.

The oil is transported by pipe line laid under the waters of the Gulf to the shore where it is then transferred to the Pure Oil Company's pipe line which carries it to their terminal on the Intercoastal canal at Gibson Town.



The Wild Well of Golden Meadow

A faulty casing valve on the lower part of the "Christmas Tree" resulted in the blow-out of Frank W. Bennett's Authement's No. 1 well in the Golden Meadow field of Lafourche Parish, approximately one-half mile from the town of Golden Meadow, on Saturday, January 27th.

All attempts to "kill" the well were futile and it quickly went out of control, blowing a considerable amount of gas skyward. The estimated flow was upward to 60,000,000 cubic feet per diem.

M. M. McKinney of Houston was employed by the operator to cap the well, but two attempts, costing in the neighborhood of $40,000, were in vain. For a short period during the second attempt the well actually flowed through four separators at the rate of 225 barrels per hour or 6,000 barrels per day. However, the well started making sand and shale which soon cut off the capping equipment that had been installed. At the time this article is written the well is completely out of control, making considerable amount of gas, shale, sand and occasional slugs of oil. There has been no evidence of "cratering" to date.

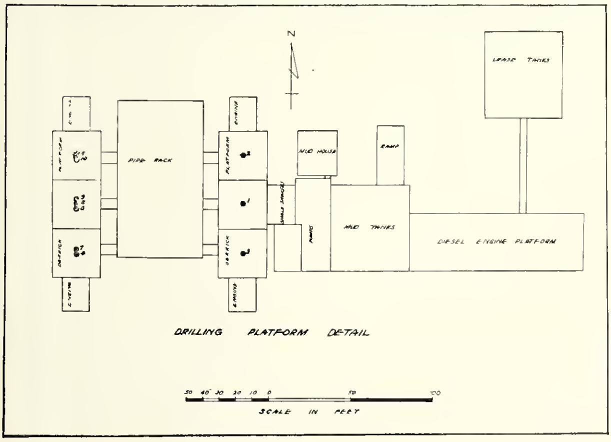
■ Frank Bennett's Arthemont wild well, Golden Meadow field, Lafourche Parish, La.

The Department of Conservation has had an engineer stationed in this field since it first became active. The Minerals Division has co-operated with the Parish authorities in endeavoring to make as safe as possible the lives of the inhabitants of the town of Golden Meadow. The well has sprayed a large part of the community with oil, resulting in an increased fire hazard. The Golden Meadow school has been closed and many people have evacuated the area which has been saturated with oil.

Plans have been submitted for drilling a directional relief well and it is the hope of all that this well will soon be brought under control.

Table Showing Present Production of Wells.

Well		Comp.	T.D.	P. Sd.	Net Oil	64 Choke	Pres. Tbg.	Gas Rat o MCF	Gr.
Gulf of Mexico State #	1	3-11-38	9394′	5110-30′	216	12	360	65	33.8
	2	7-25-38	5159′	5137-59′	409	13	725	115	34.4
	3	12-1-38	5267′	5247-67′	334	13	700	75	33.8
	4	1-19-39	5153′	5140-53′	275	11	740	60	33.8
	5		7197′	6847-54′	Gas Well	S.I.	2400		
	6	6-4-39	6832′	6765-75′	342	9	800	90	33.4
	7	8-2-39	6748′	6735-48′	175	7	1400	160	33.4
	8	10-3-39	7051′	6750-52′	145	10	200	350	33.9
	9	12-10-39	6950′	6901-03′	45	6	1400	900	36.5



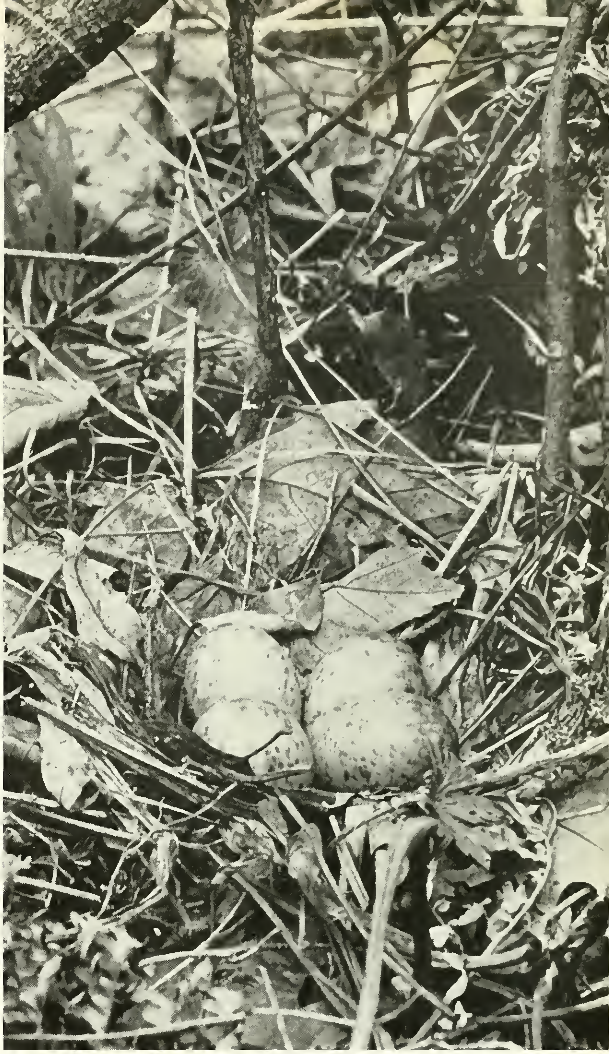
(Copyright photograph courtesy of Dr. Arthur A. Allen.)

■ Woodcock incubating her eggs.

The WOODCOCK
IN LOUISIANA

By

LAWRENCE J. MEROVKA*



(Copyright photograph courtesy of Dr. Arthur A. Allen.)

■ The nest and eggs of the Woodcock.

The American Woodcock, *Rubicola minor* (Gmelin), is to be found in every section of Louisiana during the winter months but appears in greatest abundance in the central, western and southeastern parishes. It is perhaps most abundant in the parishes of Pointe Coupee and St. Tammany. It is not common in the coastal regions of the State but occasionally substantial numbers may be found there in wooded bogs bordering the northern limits of the coastal marshes. On January 30, 1939, for instance, I came upon two hunters who had each killed the legal limit of Woodcock in a bog six miles southwest of the town of Vinton in Calcasieu Parish where a savanna-like country merges with coastal marsh.

The Woodcocks that winter in Louisiana frequent both upland and lowland coverts. Favored lowland coverts are along the Mississippi and Atchafalaya Rivers while favored upland coverts are located principally in the Florida Parishes (West Feliciana, East Feliciana, East Baton Rouge, St. Helena, Livingston, Tangipahoa, Washington and St. Tammany) and the parishes of Sabine, Vernon, De Soto, Beauregard, Allen, Grant and Rapides.

In the lowland areas the birds spend the daylight hours in dense cover from which they emerge at dusk to visit nearby feeding grounds in corn and sugarcane fields, pastures, fallow lands and burned off weed fields. On numerous occasions while driving along the Airline Highway at dusk between LaPlace and Sorrento and along the Jefferson Davis Highway between Lottie and Lebeau I have observed Woodcocks flying across the road enroute to feeding grounds. Hunters have been known to station themselves along flyways used by the birds during their crepuscular flight to feeding grounds and shoot them as they pass over. It was in the lowland areas that firelighting of Woodcocks was so popular before this unsportsmanlike and despicable practice was made unlawful by both Federal and State game laws. Hunters invaded the feeding grounds of Woodcocks at night with flaming pine torches or flambeaux that blinded the birds and made them easy prey. Great numbers of the birds were killed each winter in this manner and the practice became known as firelighting. Even today some persons persist in hunting these fine game birds at night on their feeding grounds and game wardens are constantly on the lookout for such law violations during the winter months. Today instead of using torches or flambeaux the hunters use electric headlights and acetylene or carbide lights called bull-eyes. Hence such hunting is now called headlighting or bull-eyeing in Louisiana. Persons convicted in the Federal Courts of Louisiana in recent years for hunting Woodcocks at night with headlights have been given jail sentences and in consequence the number of birds now killed in this manner is quite negligible.

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* U. S. Game Management Agent

Because of the density of cover frequented by the birds in lowland areas during daylight hours they are seldom molested there by hunters. A few are flushed and killed by quail hunters but the total number killed under such circumstances is insignificant.

UPLAND COVERTS

In the upland coverts frequented by these birds conditions are entirely different. Here they are found principally in boggy thickets created by the overflowing of small creeks and spring branches. Some of the coverts are quite wide and extensive while others are narrow and of limited area. As a general rule the bigger the bog the more birds you will find but occasionally a good many birds are flushed from a small covert. It is in the upland areas that most Woodcock hunting in Louisiana is done today. The Florida Parishes and the parishes of Sabine, Vernon, De Soto, Beauregard, Allen, Grant and Rapides all afford good Woodcock shooting over dogs. The writer highly recommends Woodcock shooting in the upland coverts of Louisiana to anyone desiring prime sport and plenty of action. A Woodcock darting through a heavy growth of trees and underbrush will tax the marksmanship of any sportsman and once you get the birds moving there is never a dull moment. Good dogs are indispensible not only in locating the quarry but also in retrieving dead and crippled birds. Frequently after a Woodcock has been shot at once or twice without being killed it will leave the bog and alight in other nearby cover and such birds are seldom found again without the aid of a dog. Many Woodcocks are killed each year in upland Louisiana by hunters out primarily in quest of quail. Woodcocks have a decided preference for heavy cover, while quail usually seek heavy cover only as a means of protection from their enemies. Therefore, when a covey of quail is flushed by a hunter most of the birds will fly to heavy cover if available nearby, and if Woodcock are present in such cover the hunter has an opportunity to bag both quail and Woodcock. Such mixed bags are quite common during January when both species may be legally killed under present regulations.

"A MEMORABLE EVENT"

I made my first Woodcock hunt in the piney woods of Grant Parish near the town of Pollock and it shall always remain a memorable event. The covert selected for my initiation into the great fraternity of Woodcock hunters began as a narrow gully and gradually widened out into a good sized bog covered with a dense growth of trees and underbrush. Even though a novice at this particular sport I knew that this was good Woodcock habitat and so I entered the bog with high hopes and my finger on the safety catch of my gun. My optimism was well founded too for the dogs soon started making game and as I was working my way toward them through the underbrush a Woodcock flushed not more than twenty feet away. Before I could extricate myself from the underbrush and take aim the bird was well away but I took a parting shot at it and missed. I marked it down and soon the dogs had it pointed. It flushed as I approached and zoomed up through the tree tops. I took two snap shots at the fleeting quarry and missed both times. To add to my chagrin I found that I had shot one of the loads into a tree trunk. Before I reached the end of the bog I flushed about a dozen Woodcocks; used up nearly a box of shells and brought to bag one bird. Up to this time I had prided myself on being a pretty good shot on all kinds of game but those long-billed ghosts of the thickets took all of such ego out of me that day and I humbly confess that even today my marksmanship on Woodcock can stand a lot of improvement.

Despite the abundance of Woodcocks in Louisiana they are the least pursued of all our game birds. It is surprising to note how few persons are familiar with these birds even in sections where they are plentiful. This is perhaps due to the nocturnal and crepuscular habits of the birds and their choice of habitat. I know of only one parish in the State where the birds are hunted intensively and that is St. Tammany. This is probably due to its close proximity to the city of New Orleans where there are thousands of sportsmen eager for an opportunity to hunt game of all kinds. A good many Woodcocks are also killed in Calcasieu and Beauregard Parishes by Lake Charles sportsmen and in Sabine, De Soto and Vernon Parishes by Shreveport sportsmen. The total kill for the State, however, is small compared to the numbers taken in various northeastern states and maritime provinces of Canada where Woodcock hunting is held in high favor.

"BÉCASSE DE NUIT"

In the North Woodcocks are commonly called Timberdoodles and Bog-suckers. In Louisiana our most common vernacular name for this bird is *Bécasse* and most people shorten it to just plain *Bec*. This name is most commonly heard in communities where the people are predominantly of French extraction. In such communities one also occasionally hears these birds called *Bécasse de Nuit* and *Bécasse de Bois*.

Woodcocks are said to nest in Louisiana in small numbers but the writer has personal knowledge of only one recent nesting record he considers to be authentic. This record was reported by State Conservation Agents Avery Hollis and Jim Perrett who stated that on April 5, 1939, they came upon a Woodcock with four young on the Singer Game Preserve in Madison Parish.

(Copyright photograph courtesy of Dr. Arthur A. Allen.)

■ **Touching a brooding Woodcock on her nest.**

■ Woodcock habitat group in the Louisiana Department of Conservation Museum, New Orleans, prepared by the technicians of the Museum staff. The birds are here shown conducting their characteristic activities in a typical Louisiana setting.

Much remains to be learned about the distribution and migration of Woodcocks. The habits of the species on its northern range are quite well known but we lack a proper understanding of its movements after it departs from that section. Most of the information one is able to obtain concerning the bird on its winter range is about as vague and indefinite as Judgment Day. The sum and substance of most available information is to the effect that it winters in South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana and eastern Texas. Proper management of the species requires that we have more specific information than this. A knowledge of its local distribution and abundance during winter is all important and it is such information that we lack at the present time. I have been trying for some time to determine if there is any other State in which Woodcocks are as abundant during the winter months as they are in Louisiana. Thus far I have been unable to locate any other point of concentration in the South but I must say here that my efforts to do so have been confined to interrogations and not actual field investigations. It is my personal opinion that Louisiana is the most important wintering grounds for Woodcocks in the United States but this as yet remains to be proven.

BANDING PROCEDURE

In order to obtain more information concerning the distribution and migration of Woodcocks I conceived the idea in 1937 of banding a large number of them on their wintering grounds in Louisiana. Now it is one thing to have an idea and another thing to put it into effect. I knew that up to that time very few Woodcocks had ever been banded because of the difficulty in capturing them but this only whetted my enthusiasm and determination. After giving considerable thought to the matter I decided to try to catch them at night through the use of a headlight and net and accordingly secured the Federal and State permits required for bird banding. In this proposed venture I was enthusiastically encouraged and assisted by H. C. Gascon and Levert Bird of Addis, Louisiana, and to these two men is due much of the credit for what has thus far been accomplished. Through hard work and persistence we succeeded in netting and banding fifty Woodcocks during January, 1937, and fifteen during January, 1939. This is a modest beginning to be sure but even so some interesting returns have already been received. Of seven Woodcocks banded on the night of January 7, 1937, near Sherburne in Pointe Coupee Parish one was killed on November 14, 1938, at Chipman's Corner, Nova Scotia, Canada. Of eight birds banded on the night of January 14, 1937, near Lottie in Pointe Coupee Parish one was killed on October 2, 1937, near Martinsburg, New York, and another was killed on October 29, 1938, near Sloansville, New York.

In connection with my banding activities I have learned that Woodcocks begin to arrive in Louisiana about the middle of November and are most abundant from the middle of December to the end of January. They migrate northward very early and by the middle of February their exodus from Louisiana is usually quite complete.

I have already revealed the type of feeding grounds used by Woodcocks in the lowland parishes. This was learned from personal observation while searching for birds to capture for banding. Some of the feeding grounds were located by watching the movements of the birds at dusk while others were located by searching for telltale borings in fields adjacent to swamps and thickets known to harbor the birds during daytime. I often found Woodcocks feeding at night where the ground was rather hard and I am convinced that they are able to drive their beaks into the ground with considerable force. I am of the opinion too that Woodcocks frequenting our upland coverts feed both day and night for I have killed birds there during the daytime that had earthworms protruding from their mouths when I picked them up. Other hunters have reported to me similar observations.

While Woodcocks cannot properly be said to be gregarious they are nevertheless quite sociable and as a rule where you find one bird you will find others. As a typical example of the sociability of these birds while feeding at night I found twenty-two of them in a six acre field in West Baton Rouge Parish one night in January, 1939. At no time have I found these birds widely dispersed while feeding at night. You can go into a very large field at night in search of Woodcocks where soil and cover conditions are apparently identical throughout the field and if you find any of the birds you will find them all feeding in one section of the field.

I am anxious to secure as much information as possible concerning the distribution and abundance of Woodcocks in the South and so in concluding this article I wish to make an appeal to all readers able to furnish such information to communicate with me at 1105 Masonic Temple Building, New Orleans, Louisiana.

The accompanying fine photographs of the Woodcock and her nest are provided through the courtesy of Dr. Arthur A. Allen, Professor of Ornithology, Cornell University, eminent American ornithologist whose wide studies have included expeditions into Louisiana.

* * *

BIRD BANDING

Some most unusual flights have been recorded through bird banding. For instance, the long-eared owl is not supposed to be much of a migrant, isn't supposed to travel very far. Yet, a long-eared owl banded at Escondido, California, was shot at Corbell, Ontario—having travelled a distance of more than 3,000 miles—across the country from South to North and almost across the country from West to East.

Perhaps without banding records, ornithologists would not know that the redhead duck migrates east and west, and vice versa, not north and south, as do most migrants.—*From The American Wildlife Institute.*

The Louisiana Geological Survey

The Louisiana Geological Survey continues with enthusiastic vigor to carry out its program of mapping and publication. Such a program will eventually result in a detailed geologic map of the state and comprehensive bulletins describing the detailed stratigraphy, physiography, paleontology, and economic geology of Louisiana. Bulletins of the various parishes most of which include colored geologic maps of each parish on a scale of 1:5,280 are being published at the rate of two or more per year. Companion bulletins dealing with the paleontologic problems encountered in a parish survey are usually published more or less coincident with the publication of the parish bulletin.

Such a program is made possible for the Louisiana Geological Survey by the close cooperation of its director, Dr. H. V. Howe with the School of Geology at Louisiana State University. Faculty members and Ph. D. candidates in the School of Geology are selected to work from one to two parishes during a period of two- and one-half years. In the case of a candidate for the doctor's degree, his final report is submitted as a dissertation for the degree. The field and laboratory work, and the final report are all carefully supervised by the staff members of the School of Geology and the Geological Survey who through practical experience and research are well acquainted with the problems in the state. In this manner work of an excellent calibre is obtained at a minimum cost. At the same time capable graduate students are enabled to work for a degree which might otherwise be financially unobtainable.

The research facilities of the Louisiana Geological Survey have been greatly increased through the construction of a new geology building by the Department of Conservation and the P. W. A. on the campus at Louisiana State University. The new survey research division in this building now consists of offices for the assistant state geologist and staff; a paleontological laboratory for picking and identifying microfauna from well samples; a wash room with a battery of 12 sprays for washing well samples; file rooms for well logs, electrical logs, maps, etc.; a cartographers unit; and store rooms for publications. Two huge attics are also available for storing the thousands of cores and cutting that are sent to the survey from wells drilled in the state.

The Louisiana Geological Survey has also been actively cooperating with the groundwater division and surface water division of the United States Geological Survey. Both divisions have sub-offices in the recently constructed geology building on the campus of Louisiana State University. Each has submitted reports during the last year which were published as bulletins of the Louisiana Geological Survey through the cooperation of the Louisiana Department of Conservation and the United States Department of Interior, Geological Survey. Continued work by these divisions should provide data that will eventually be of much use to the people of Louisiana.

A new bulletin, now at the printer's, will soon be available on the ground water resources of that part of Louisiana centering around Avoyelles and Rapides Parishes. The data revealed in the bulletin should greatly facilitate a feasible program for obtaining a sufficient water supply in this part of the state.

Another manuscript ready for the press deals with the Tertiary bryozoans of the Gulf Coast. This bulletin will undoubtedly do much to assist in making more accurate correlations between Tertiary sediments in Louisiana and other states.

At present the work on Avoyelles and Rapides Parishes is rapidly nearing completion and should be through the press within the next three months. Besides including a detailed stratigraphic discussion, especially of the Miocene, this bulletin also includes interesting observations on the physiographic history of the Red and Mississippi Rivers in the area covered by the report.

The manuscript on Natchitoches Parish will soon be in also. This report will cover an area in which strata ranging in age from the Sabine group (Lower Eocene) to the Catahoula group (Miocene) are found. A rather interesting picture of Tertiary stratigraphy and sedimentation should be obtained in this report.

Other parish surveys are also nearing the final stages: Bienville and Jackson Parishes with Lower Claiborne and Sabine stratigraphy; Vernon Parish lying in the heart of the Sparta-Wilcox trend; St. Tammany and Washington Parishes with interesting problems in Pleistocene physiography; and East Baton Rouge Parish with the University oil field. These bulletins will provide a wide variety of subjects and data to those workers who are interested in the geology of Louisiana.

A state-wide sand and gravel survey is now in manuscript form. It will present a number of interesting facts regarding these resources in the state. Not only

[Turn to Page 40]

Fishin' for Fun

By
Steve Benedict

[Illustrated by Roy Odom.]

This is a story about fishing for fun. It is not intended for those men who drag long seines over soft mudflats or who run catfish lines so they could eat and dress and buy more catfish lines to run. This story is written solely for the man who every so often breaks out in a light mania, which makes him forget everything but rod and reel. Hot suns do not bother him then, nor yet mosquitoes that sting or ants that harvest his noonday lunch. In this state of mind he will gladly pay a dollar or more per pound for fish, and he will brag about it to boot. I know him well. He is the finest of fellows, a prince as a companion. He is a nature lover, a sport, a braggart, a good-natured liar—a gentleman. If you are of that breed, then read my little story. You will profit by it, I am sure. If you are not, then pass on, please. This can never interest you, for it can interest only those who go fishing for fun.

Fight chance. These are the lures of fishing for fun. These tear you from your desk, from behind the counter or behind the plow. They set you dreaming; they mingle with your blood and make you mad. Life is part gamble and part fight. At heart each of us loves to take a chance, each dreams of pitting his brawn and brain against some adversary. Deep within every mother's son of us is a lightly sleeping caveman, and every now and then he awakes and is far indeed from satisfied with the desk or the ribbon counter or the mechanic's bench. What he demands is life in the raw, and you had better satisfy him or he will never leave you at rest. Some see bull-fights to satisfy them, some scrap among themselves, others go hunting or hike in the woods, but you—you go fishing for fun.

Vacation time arrives. The days are hot and long and lazy. Out of a steely sky the sun bakes the naked city pavements. Far away, in your mind's eye, the grass looks soft and the trees very green. The slumbering caveman awakes. Unconsciously almost, you reach for rod and reel, and then, after that, you cannot rest. Am I wrong?

But let us cut this introduction short and get down to business. You are off. Several of you have developed the symptoms at one time. You have clubbed together and have finally decided on some place to go. Each one inspects his outfit (paraphernalia, if you are of the big-browed set). What hooks to use? What kind of line? Bait? What is best? "Shall we bring it or depend on getting some down there?" "Bring the dipnet along, fellows." And so on and so forth . . . yet, just the same, I have found out enough about deep into the night, over the steins, at the Dutchman's on the corner.

■ ". . . the slumbering caveman awakes."

And thus, here my tale begins.

I have guided you, not many, just a few. And yet, just the same, I have found out enough about you to warrant these few advisory words. I have garnered them from the mistakes I have seen you repeatedly make; from the questions that you kept asking me. Remember down there at Redfish Bay?

First of all, a man who has not fished much has to learn this: It is oftener that you do not catch fish than that you do, and quite a bit oftener at that. Ask anyone who has fished steadily for several years. And so patience—that's what you will need most to take along with you on every trip. For fish are strange folk. They do not always play according to Hoyle or any other set rule. They may bite here today, there tomorrow, without rhyme and without reason. The day might be fine, the water just right, the tide O. K., the bait of the choicest, the wind could not be better if you ordered it yourself—and yet not a nibble. And on the other hand, I have caught them already in muddy water; in wind where the skiff dragged its moorings; on bait that a buzzard would have left alone. Maybe they were starving, I do not know. But you will get used to all this later on, after you have fished long enough.

But I am wasting my paper and your time. I started out to give you a bit of advice on how to fish, and here I go rambling on just as if . . .

"Where are we going, down the Delta? Well, what hooks will we need? Shall I take my coat?"

It is a novice, of course. It is his second or third trip. Lake Pontchartrain and ten ounce croakers have so far been his boastful limit. Well, he will meet up with something else down below, never fear. He will have cause to brag.

Now, I know absolutely nothing about a rod and reel. Few men who live by catching fish do. A rod and reel is sport, true enough, but true too that it takes time, and time to a fisherman, as to any other business man, means money. He cannot waste precious minutes playing at war with a fish. He must land him right away. But just the same a hook is a hook, whether it is on a rod and reel or on a trot line or a common slaughter pole. And just now I would like to comment on hooks.

THE GRAVE MATTER OF HOOKS

Left hand hook; right hand hook. No, I am not trying to be smart. This is earnest. It is school. Pick up a curved hook and hold it in front of you. In most hooks the curve or twist (held this way) turns left. Practically all long shank trout hooks and the cheap wire trot line hooks belong to this lot. Snapper hooks are also left handers. The right hand hooks are those short stubby bronzed ones—sturdy little fellows—commonly referred to as sheepshead hooks. Take a few along, they will come in handy. And never be afraid to use them, even the smallest one will hold a ten pound fighting red.

For sheepshead take along a few 1/0 sheepshead hooks. (Note: Sheepshead hooks are not measured as are the others. A 1/0 sheepshead hook is almost as big as a 6/0 ordinary hook, though not as long. The size of any hook is the measurement from across the point to the stem or shank, and not the length.) A 2/0 hook is a bit too long. Sheepshead have small mouths you know. And be sure your hook is twisted. A sheepshead's mouth is one solid, jagged millstone of teeth. You will always catch him on the side of the mouth, or close to the edge of it. If you missed him look at your hook point. Chances are he has bitten it off. Throw it away. And when you take Mr. Sheepshead off the line, for the love of Pete, be careful. He will bite you, he will stick you, he will slap you, he will scratch you, he will . . . The best method is to let the guide do it. Maybe he knows how.

Straight hooks are fine for reds and drums, but not so hot for sheepshead. The points break off too quick on his powerful grinders. Personally, I prefer a twisted hook all the time, for any fish. Prejudice, maybe, but I do not know, I have always done better with them than with the straight variety. However, never curve out a straight hook. It takes away its temper. So throw in a few 6/0 O'Shaughnessies (Harrison is printed on each hook. They are English made. Five cents each.) A 6/0 is plenty big. It will hold a 25 pound bull, if you can. And if you would like to take home a few small drums and croakers or a pound and half rat red or two, take along a couple of 4/0's too—just for luck.

Never buy cheap hooks, wire hooks. At the end of the trip they will cost you tenfold. A sheepshead or a big redfish will straighten them out for you before you have pulled him halfway to the boat.

For trout use those long, thin, slender hooks. A trout has a very soft, large mouth, and he is a fighter. A short hook will catch him in the mouth, and the chances are he will tear it wide open before you could get him in, and he is gone. He must be caught away down deep. Ask for long shank 4/0 trout hooks when you are going out to Breton Island to give those big speckled fellows hell.

AND NOW HOW ABOUT BAIT?

And that is for hooks. What is next? Bait. Oh, yes!

Live shrimp, by far. They all fall for it. Take a cast net along, do not be lazy. Learn how to throw it. It will not take long. Of course, it pays to buy shrimp in town and take them down iced, to make sure, but the moment you have caught or bummed enough fresh shrimp, dump the old stuff over the side. Mullet is good too, especially for reds. Some good fishermen even swear by it, but somehow sheepshead do not care so much for mullet. They will even prefer crab to it.

In a pinch, fiddlers will do. Sheepshead like fiddlers. Reds I have caught on tiny croakers already, and many a fine one on crab. For a trot line crab is best. It lasts the longest and does not attract gars. But for pole, rod or handline use shrimp—exclusively.

Many a good fish has been lost just because the fisherman did not know how to put on his bait. Put your bait on so that in order to get it the fish will have to take the hook too. Cover the hook well with it. Here is what I am talking about: Pinch off the head and throw it overboard nearby, as a lure. It may help a bit. Then stick the hook through the tail end of the shrimp and curve it with the hook. There. Even the nibbling type will sooner or later have to grab your hook. As for a redfish—huh! Once he snaps at it, he is gone. Bait stuck on haphazard—Lord! Just as if a fish did not have any sense.

Crabs. Best not to use the claws at all. They are so hard to put on right. Cut a fair sized fellow (cut, do not hack) into four or six equal parts. Stick your hook so that it will not pass through any of the shell parts, for that will only act as a sort of sheath. There is a way. You will find it easy enough if you try. Do not crush the crab. It will fall off your hook if you do.

Cut mullet into half-inch slices, or a bit thicker. Run your hook through the white underpart, twist, and then run it the second time through the flesh. Mullet is soft bait. A fish nibbles it off your hook quick. Gars and sharks are crazy about it, and ditto for crabs.

Some people allow a tiny bit of the hook to stick out of the bait. To others this method is little short of inexcusable. "Cover your hook all over!" they will yell at you from halfway across the bay. But that is a moot question. I have caught fish both ways. Also I did not catch fish both ways.

In re baiting a spot. Many a fisherman is in favor of it. Many think it a fool's idea. "They will eat that stuff and leave your bait alone," the latter folk will tell you. Others assert that it attracts them. I lean a bit toward that view myself, especially when throwing for shrimp. Break up clams or oysters and throw them along the shore. Then wait awhile and then go back there with your cast net. You will see. I think it is a good idea to bait a spot.

I have a good friend. His name is Big Mike, and he is a fisherman for real. One day Big Mike and several other Dalmatian Slavs were seining somewhere on the Louisiana Marsh shore. They had a thousand foot net and yet all day long they caught nothing. They were disgusted, ready to go home. "Wait," says Big Mike. "Let us fish some oysters and crush them and throw them overboard. No need to go in with no fish." So they pulled over to the natural reefs and fished a bew barrels. Then they crushed them and threw them over, into about three feet of water. They waited awhile. Next they circled the spot with their net. Result: Three barrels of sheepshead. It paid to bait that spot all right.

No exaggeration. No fish story this. Men who live by fishing seldom lie about fish. In fact, it usually is the opposite. They do not want the other fisherman to go there too. Business is business, you know.

AND THIS IS HOW THEY BITE

And this is how they bite (as a rule). A redfish grabs it and runs. No hungry 'bo ever hooked teeth swifter and harder into a hunk of pie than a hungry red into a nice succulent shrimp swinging on an O'Shaughnessy 6/0. Use a stout rod for him and a strong line—at least a 35 pound test, linen or silk. It does not have to be so long. A redfish is not a tarpon. Fifty feet will do fine. But be sure that it is strong, and a big ditto for the pole. I have seen a big bull break Mr. Vacarro's rod, and then when he grabbed the line, it gashed deep into his hand for two or three inches. Oh, he got him in, all right. We weighed him (her, rather, for the bull, paradoxically enough, is the female of the species) in camp. Twenty-seven pounds! No wonder. Yes sir, your red is a fighting fish. I have seen more than one man sweat as a ten pounder tugged for dear life and splashed white foam madly at the end of his line. And a ten pound redfish could put up a hundred pound fight at the end of a pole, so hold your rod with a grip of steel for the battle is on. He is ten pounds heavy, and every blessed ounce of him is fighting red. So hold tight; play him; pull. Swear all you want, but do not let go. And learn this: Once you get his head out of water, he is yours.

Speckled trout bite about the same. They too, like the hungry 'bo, grab it and run. A twenty-four foot slaughter pole (bamboo—25c) gives the best results here. But if you do not know how to use one, the fellow who does, in a good run of trout, will catch ten to each one you land. You have to be quick. It is no place for joking or for sleep. Alert, that is the word. Watch that cork. The moment it pops you jerk the fighting speckled beauty out of the blue splashing water, and with that same swing hit him hard against your chest. Two seconds later he must be off your hook. But be damned sure that you can tell he is by the way be bites. It would not be so funny if you smashed a hardhead cat against your belly.

Sheepshead, crabs, stingarees, drums, catfish. These are the nibblers. They all bite pretty much alike. They seem to play with your bait, though a slow tautening of your line usually means a crab. He likes to walk home with your bait.

Sheepshead and drums have such small mouths that they can seldom gulp down a big shrimp with one lick. So, if these are biting, (and it is not hard to tell) change to a smaller hook—a good hook, or else a big sheepshead will bite it in two.

And for the love of Pete! be on your watch. Keep your eye steadily on that cork; if you are using a handline be ever ready for that telegraphic quiver. You are not fishing redfish now, you know. A sheepshead takes his time, so you do the same. Do not be too anxious. No rush. You will only rue it the next moment. Remember once more, a sheepshead has a very little mouth and it is chuckful of teeth. I will repeat: He nibbles. And unless the baited hook is deep enough in his mouth it will merely grate along his millstone-like crushers, and he is gone. So let him nibble your bait a little while; even let him take the cork under once or twice. Then jerk. And then fight. For a sheepshead is not any slouch either.

And when you feel a deadweight tug—like a piece of lead—it is a stingaree. All yours. Be careful.

PLAY YOUR BIG FISH

Play all your big fish. Let them tire themselves out. Then they will come to you, belly up, like so many little babies. A big fellow will tear his mouth if he is not hooked good and you pull back on him or jerk against him too strong. With a long bamboo and a reelless line it is different. It is a steady strain—no jerking. The pole takes up most of the tension.

Now—how to handle fish once caught. A good way is to let the guide do it. That is what he gets paid for anyhow. Besides he knows how. But if you are foolish enough to like to handle your own, here is a rule or two. Bend a fish into an S, head up. Never grab a fish by the eyes. You will lose him, sure as hell. Take it from me. I have seen professional fishermen lose some nice fish that way. Do not be afraid to stick your thumb into a redfish's mouth. He could not bite you if he wanted to. With your other four fingers through his gill slits and your other hand firmly gripping his tail and pushing upwards, I will guarantee you a twenty pound bull will find it hard to get away.

FISH CAN SEE YOU

Carry a small fish box with you, or a sack. Tie your fish overboard. They will keep better that way. Do not fish out of a gas boat. Fish do not like to eat gasoline any more than you or I do. Besides the propeller scares them. No noise. No singing. Even the oars must not squeak. Try not to paddle or row too roughly. Tie your skiff close to shore. A small pirogue or canoe or dinky, I believe, is the best. It could be shoved into the canes or grass. Avoid real clear water. Fish have eyes. Do not fool yourself, they can see you. Be careful how you handle your fish when you are pulling them in. Do not be rough. Do not jerk. Take it easy. And never let a fish get under the boat. He will pry himself off your hook every time. Sheepshead come close. I have seen two and three at one time right by my boat. Also a sheep will not always run away once he manages to get free of your hook. Like a gar, he will come back for more. He will hang around and get caught all over again. I have seen them in clear water follow my bait as I dragged it along.

Trout and redfish, however, are made of different stuff. They are scarey. They refuse to come close, especially a trout. You must throw your line way out or use a long pole. For trout a twenty-four foot bamboo is best. Rig it up with a No. 12 soft line, a light lead, a small cork and a thin shank, extra long, 4/0 hook, twisted preferably, and you are all set. Bring your dipnet too—all the time. It is never in the way.

Some more. A drum will turn tail to you. I have noticed that time and again on my trot lines. Sheepshead, like gars, pull down. A redfish—oh, he jumps and he splashes; he dashes, he darts, he bucks; he raises all manners of hell.

OYSTER REEFS ARE BEST

Fish bite best over oyster reefs—all kinds of fish, I mean. But be sure to use a cork, else you will lose your sinkers and hooks all the time. If you are using a handline, throw it about ten or fifteen feet out from the shore, away from the oysters. You will catch crabs, at any rate.

Give your hook about two feet of line below the cork. Fish as close to the shore as you can. That is where they are, by the grass, feeding on the little stuff or nibbling the barnacles off the roots. You will see the canes jerk now and then, if you watch close enough, or even their finny backs pop out of the water; or maybe a drum's tail flopping, as his head is deep among the oysters.

Redfish like brackish water best. Drums bite mostly on the bottom. Like catfish, they are bottom feeders. But for your sheepshead and redfish, fish close to the grass.

Some sports prefer to sit in one spot (especially if it is a shady spot) and wait. Other sports consider this method poor fishing. "Follow the fish," they say—where to, I cannot tell. But my guess is, that it is simply luck. There is no hard and fast rule. Sometimes you catch them sitting and waiting, and sometimes you do not. And ditto for the other way. It is all one.

Maybe you have an idea that all you have to do is to drop your line over the side and pull in a big fish. Oh, yeah! Forget it. That may be O. K. in a hatchery, but it is the bunk any place else. You have to wait for your fish—and pray. And for each day that you make a good haul, there will be a dozen days when all you will bring home will be a few croakers and a half-pound drum. Take this from one who has gone out day after day to fish—so he could buy overalls and grub.

TWO IS COMPANY

Let your line go out with the current or tide, never against it. It will go under your boat, as sure as you are born. Then you will have lots of trouble should you hook a big one. And do not overcrowd a boat. Two is enough in a small skiff or duck-boat; one in a pirogue. Keep very still. Fish are scarey folks. Never throw fish-guts overboard where you are fishing. It will attract every crab on the bottom of the sea, and a lot of gars besides.

If you are using a handline, get 12 or 16 soft or medium. Hard laid curls up so quick, besides being tough on your hands. Braided line is the best. Never use rotten or old line, you will rue it—swearing is useless and too late. Dry your lines well, stretched out, after each trip. That is a money-saving scheme.

If you are using a long pole (on reel) be quick, once you have him hooked. But be careful. A red will grab it, but a sheep or drumfish must be allowed to nibble awhile before you jerk. Then once he has that cork under and the hook in his mouth, hold tight to your pole. Shove the end of it into the pit of your stomach and pull hard. Never slacken. He is gone, if you do. Keep your balance. And then once you get his head out of water . . . Oh, boy!

And if you should catch a shark, beat it. The fish already have done so. And you just as well do so too. Then when the gaff-tops and whitings start in on you, hunt newer fishing ground too. That is the best formula I can offer. They will never leave you be; they are merciless and their name is legion plus. Your bait is gone before it is a foot under water.

FISH THE SHORE-LINE ON AN INCOMING TIDE

With the incoming tide, I have always found the shore-line to be the best, especially over oyster beds. Fish close. But when the tide is going out good, park your sweating carcass at the mouth of some bayou, or up in it a ways. The fish are coming out, following the mullet and the shrimp. Never fish when the tide is real high and everything is under, nor when a high river has made every bit of water look like chocolate. You will only be waisting your time. Better stay home and brag about the big ones you have lost. When the water is over the land the little fish are in the openings among the canes and mash grasses, and the big fish, as you already know, follow the little fish. Too, when there is lots of bait jumping in the water you will have but little luck. Well-fed fish do not bite so hot.

Flounders you will spear. Any good sandbeach or sloping mudflat will do. Find one. Make sure that the water is clear. Then wait for a quiet, moonless night. Wind will spoil everything. Wait until the tide is fairly high. Then get a good torch, you can buy one on Decatur Street in any fisherman's supplies store for about two dollars. Also get a prongless spear and a sack. Take a partner along with you. Make him carry the sack. Walk slowly in about eight inches of water, and be careful not to stir up the bottom. You will see Mr. Flounder plain enough. He will be taking it easy, lying flat on the mud or sand. Now is the time you have to be real quick. Your light blinds him only for a little while. Spear him. Do not let go; keep pressing down on him firmly. Never mind his splashing. Then let your partner put his hand under the flounder—the prong of your spear between his fingers—pressing upward. Walk ashore together. Put the flounder in the sack and go get another.

But be careful. Make sure it is not a stingaree—his tail is bad medicine. It is not hard to tell the difference.

Any beach or flat at the Delta mouth is good floundering—Port Eades, Burwood, Redfish Bay. Breton Island has those big ones—eight, ten pounds—flukes, they call them. Try a fluke on a spear point once. I will say you will have some fun. Better bring two partners along.

My idea of good fishing is winter fishing. For every fish that you catch during the warm months, you will catch ten during the colder ones. And that is no hot air either. Ask any good fisherman. They hardly ever fish during the summer days. Winter time—that is when the big fellows come in; the thirty-pound bull reds and the big drums, half again as heavy. Only they do not fight so well—if that is what you are after. They are dormant; cold. A couple of winters ago a partner of mine—Joe—caught a twenty-five pound redfish in a pair of oyster rakes. Believe it or not.

AND HOW ABOUT TARPON?

Well, just a few more words and you can go. Lots of foolish hullabaloo about tarpon. (Who wants a tarpon anyway? They are not good to eat.) Guides grin among themselves when they hear you fellows boast about the big ones you have hooked. But just the same, learn this: a tarpon never fights the line. He fights the hook. So do not jerk on him; do not pull hard. Let him have all the slack he wants. I have seen them jump straight up out of the water, like gilded arrows, and shake their heads like unruly horses, trying to shake loose the hook. So give him lots and lots of line. Play him; take it easy; this is no tug-of-war. Your line is no hawser. He will tear it—watch out. And if you are careful and a good fisherman, and are blessed with oodles of patience and a strong arm, you will be able to catch tarpon on a 36 cotton line, and a small, strong hook. No kidding. I have seen it done.

But I rather catch groupers any day. He has dead weight but no fighting spirit (like a shark). Use live crab and big hooks of the handforged type, curved inwards toward the stem. You can get them for about six bits on Decatur Street, by the river. Use stout wire leaders and about fifty feet of untarred ⅜-inch rope. It is the best way to fish them, I have found.

Fish out of a big boat. Tie your crab to the hook, but so that his claws and flappers are free to move. Or else hook him through the hindmost part, all the way through. Do not worry. A grouper has a big mouth. He could take a whole crab easily.

Forget the old rod and reel. It will only be in your way. At rising tide, during the warm months, around the old sunken Yuma a couple of miles out of Southwest (Burwood) Pass, you may mop up on them, if you are lucky. I know one fisherman who caught fourteen in a few hours. One of them weighed around five hundred pounds.

Do not use too much line. You will not need it. Groupers play out quick. Weight is their sole reliance. Get hold of a good-sized boat—nothing less than thirty feet, and high enough. Squalls hit quick and hard, you know. Make your boat fast to the mast or davit of the sunken ship. You have about eighteen feet of clear water to fish in. Be careful where you throw your hook. If you do not throw it far enough out it will catch on something and you will have to buy another. I lost four in one afternoon. Too far is no good either. The groupers hang around the wreck. But after the second or third hook you will learn.

Leave your rod and reel at home. You will only let out a lot of line, and then what is the sad result? The big fish will tangle it all up around some underwater part of the sunken vessel. Then all you could do is to cut the Cuttyhunk and curse—and wish you had listened to me.

■ Louisiana's new Port of Entry, located at the north-west boundary of Grand Pass, through which Mississippi boats fishing in Louisiana must clear. This building includes the office and quarters of the inspector at Grand Pass as well as the biological laboratory of the Division of Oysters and Water Bottoms. Experimental tanks and cistern are seen in the foreground.

Preliminary Report on an Experiment in Oyster Hybridization

By

Lawrence D. Kavanagh*

Viewed from an economic standpoint, the importation to the Pacific Coast of the Japanese oyster, *Ostrea gigas* Thunberg, and its culture must be regarded as most successful. For in the period between 1922 and 1935, in the State of Washington as an example, this industry increased in output more than two thousand times and since 1935 has increased even more; (lack of figures makes an exact estimate of the increase impossible.) The production of the "Pacific" oyster appears to have become a million-dollar industry.

The manner of oyster culture employed on the Pacific Coast involves, of course, great care and labor. The spat or seed shipped from Japan in clusters on shells must be bedded in favorable marine environment and repeatedly culled or worked over for the proper growth of individuals. The rather powerful storms of the west coast sometime sweep oysters great distances from the beds in which they have been placed, often to pile them up in reefs; readjustment and respreading are then quite necessary for the assurance of uniform growth. Oyster-pest control also must be diligently practiced.

The reward, however, justifies the work. Rapid growth to marketable size allows a quick turnover. As a matter of fact, in a period of two years, Japanese oysters grow to a size much greater than that attained by the Louisiana oyster in three or four years and, as such, are yet the canned oyster of fullest size. Roughly, Pacific oysters average forty to fifty (sometimes more) to the gallon, whereas the native oysters of the east coast (the Louisiana oyster included) average 150 to 250 to the gallon, and the native west coast (the *Ostrea lurida* or Olympian) oysters average about 1600 to the gallon. In addition it has been claimed (though this investigator knows of no exact scientific papers giving definite proof in the matter) that *Ostrea gigas* is unique among oysters in that the processing of steam canning removes none of the glycogen of the animal. Finally, this oyster has opened a new market for the west coast fishermen, who are now shipping them under refrigeration to localities in the West and mid-West where, for the first time, raw-stock oysters are being made available at a fairly reasonable price. This new market in 1935 absorbed 250,000 gallons of oysters at a value of $300,000 to the producers. (This information from the publication "Oyster Culture", by Ernest N. Hutchinson, Secretary of State, the State of Washington.)

It would seem, then,—if the facts pointed out above constitute a full picture of the west coast oyster situation—that Louisiana would do well to consider the introduction of this animal as an adjunct to its own oyster; that the Japanese species would provide an oyster for the canneries of Louisiana and Mississippi which would be more of an ideal from a standpoint of size and shape and texture.

SEED OYSTERS FROM JAPAN

Several things, however, have militated against such an importation. In the first place, the problem of shipment of seed oysters from Japan here is an expensive and somewhat clumsy one. Again, it is feared that these animals, in promiscuous introduction, will carry with them into Louisiana's coastal and marsh waters (the natural habitat of its oysters) their own native pests and parasites, obviously a danger religiously to be avoided. (It may be stated, by the way, that already, on the west coast, the Japanese oyster drill, *Tritonalia japonica*, is becoming a definite menace.) Finally, *Ostrea gigas*, though an oyster of beautiful size and shape, is remarkably flat in taste.

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The ideal oyster would, of course, be one possessed of the size and rapid growth characteristic of the Japanese species and the taste and quality of the native Louisiana oyster—*Ostrea virginica* Gmelin. Such an oyster, if it brought in no additional pests and parasites personal to it, if it developed well in the waters of Louisiana, if it were obtainable in practical quantities, would no doubt be received most warmly by the fishermen, canneries and counter-men of Louisiana and Mississippi.

In an effort to investigate the possibilities of the production of such an animal, the program of oyster investigation now in progress was instituted in the Division of Oysters and Water Bottoms. The investigation purposes the determination of the possibilities and feasibilities of the mass production of a hybrid oyster, an oyster bred of the native Louisiana and of the Japanese species.

PURPOSES OF INVESTIGATION

The program must look into many questions of possibilities: the possibility of the introduction of the Japanese oysters for experimental purposes without allowing the introduction of oyster-pests; of effecting cross-fertilization between the two species, of rearing to "planting size" of the laboratory produced young fry; of rearing to market size of the seed oysters; of mass production of the animals. It must be found out whether or not the hybrid oysters are capable of healthy growth in Louisiana waters; whether they can withstand its oyster pests. The effect upon the native oysters of these new individuals must be considered. Finally, the growth-rate, ultimate size, taste, texture and quality of the hybrid must bear investigation. Only after such a comprehensive investigation can the advisability of the introduction of a new oyster be decided.

The program is still in a very early stage of development. Arrangements have been made at the State's Port of Entry at Grand Pass for the use of its facilities as a biological station, equipped for this work. There were imported several cases of seed oysters and mature oysters from Japan for use in the experimental work of the investigation. The mature oysters were to be used as necessary sex-partners to the hybridization of the new oysters; the seed oysters were to be set out in an attempted cultivation to maturity for ultimate use in the experiment, the object being to determine whether or not seed oysters alone could be brought in for the work (since, of course, such a system would be cheaper.)

DISAPPOINTING MORTALITY RATE

Whatever the cause, however, the seed oysters showed a most disappointing mortality-rate. Upon investigation, it was found that only an insignificant few are still alive, and these are in poor condition and have shown little growth in the nine-month period in which they have been in Louisiana. Possibly the long trip on importation constituted too extended an absence from water, possibly the site selected for their new planting was unfavorable, possibly there is some factor in the water of Louisiana which is beyond the tolerance range of the Japanese spat. In the case of the mature oysters, the mortality was not quite as high and in a few cases the animals did very well. On a rough calculation, forty percent of the mature oysters failed to survive for reasons unknown, forty percent perished upon exposure to the summer sun in an unusual and prolonged fall in tide, and twenty percent were used experimentally. In the case of the oysters whose cause of death is unknown, the reason may lie in the fact that they were placed in water which was for four months unusually fresh, showing a specific gravity range from 1.004 to 1.008, which is, at most, hardly favorable for oyster growth.

It was also found that the mature oysters failed ever to spawn prolifically, though the gonads showed a small amount of spawn in early summer, increasing to a fair amount in late summer, after being for a relatively great period of time in water of constantly high temperature (average 83°F.). Galtsoff (1932, *Introduction of Japanese Oysters into the United States*, Fishery Circular No. 12, U. S. Bureau of Fisheries) found that *Ostrea gigas* spawn abundantly only under a prolonged temperature of 86°F. in the absence of stimulus other than heat. Galtsoff found, however, that with the addition of a small amount of sperm to the water, *Ostrea gigas* will spawn at a lower temperature (77°F.). In the work at Grand Pass, however, it may be safe to assume that there was no appreciable amount of sperm from *Ostrea gigas*, and it cannot be assumed that the sperm of the native species, *Ostrea virginica*, is capable of evoking the spawning reaction from the Japanese oysters, especially since such native sperm was undoubtedly present in the water.

NEW TYPE OF EMBRYONIC OYSTERS

In the hybridization experiments conducted, then, the investigator was forced to use oysters not in the optimum spawning condition. It was found, though, that cross-fertilization readily occurred, establishing then the production of oysters (though embryonic) which were of a new type. In elaboration of this matter (by way of explanation), it may be said that the life of an oyster may be roughly divided into three periods: the embryonic period—from the time of the fertilization of the egg by the sperm up to the last cell division before the next definitive form is produced; the larval period—from the development of the swimming organ of the animal, enabling the individual to move about independently, up to the re-sorption of that swimming organ; and the attached period of life of the oyster—after the swimming organ is retracted, when the animal attaches itself to a mooring point, where it remains thenceforward to continue life in a pro-

■ **The biological laboratory of the Division of Oysters and Water Bottoms in the Port of Entry building at Grand Pass, La.**

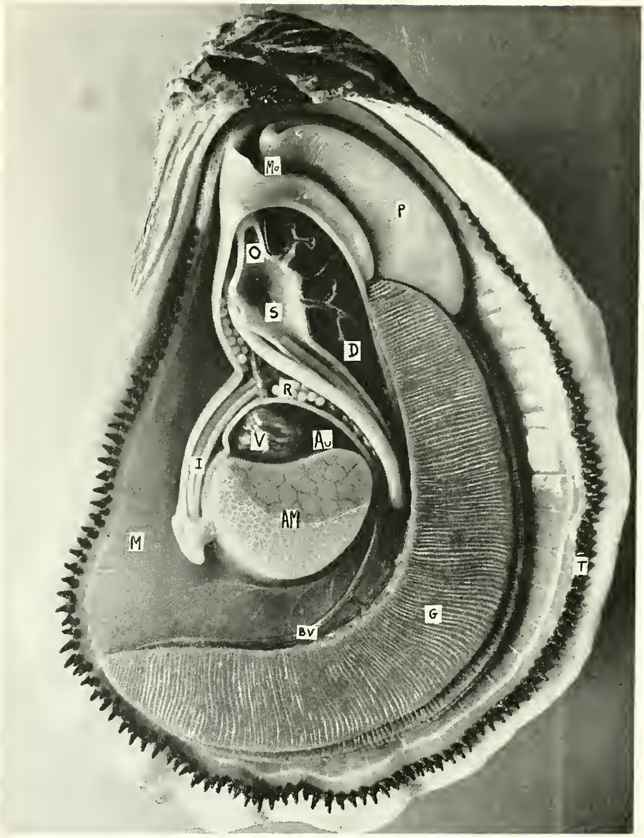
cess of growth characterized only by increase in size without change in form. In the experimental work, the young hybrid oysters were cultured through the embryo stage and into the larval stage (over a total period of two or three days); at that time the oysters would be well-formed larvae. Yet, through some imperfection in the culture technique, the oysters were never brought to the final, attached or adult stage.

The factors in the culture which made it impossible to produce adult oysters are still under investigation, the end being, of course, a refinement in the technique which will make possible the production of attached oysters. Several influences have been checked. It has been determined that the pH of the culture medium is favorable (extending over a range of 8.2 to 8.6), that the temperature may be controlled to the proper range, that the salt concentration is a good one. For a time it was thought that there could be a possible calcium deficiency impeding continued growth, but controlled experiments were negative. What remains to be looked into are the matters of providing abundant oyster food for the larvae, the assurance of an adequate oxygen supply, and the matter of the removal of toxic waste products elaborated by the developing larvae themselves.

NO SPAWNING IN WINTER

Little work can be done at the present time, since winter temperatures make spawning (and, consequently, fertilizations) impossible. Preparations for an early return to actual laboratory work are being made, however; a system of finer filters for the work is being installed. (Filters are necessary for the retention of the microscopic oyster embryos upon changing the water in which they are being cultured and for the removal of predatory forms from the new culture medium to be used.) A new shipment of oysters is to be made shortly, so that the necessary individuals of the Japanese species will be available. Care will be exercised that these imported animals bring in no new parasitic forms: they are to be placed in control tanks far removed from the water; water will be pumped up from Grand Pass to them, and the excurrent flow of water will pass into the ground thirty feet removed from any oyster water.

Once the problem of rearing the laboratory-produced hybrids has been overcome, the work of the investigation will continue in a determination of the other important points: growth-rate, ultimate size, taste , texture, and quality. Also to be investigated will be the effect created on the native oysters by this new form, especially the matter of possible independent cross-fertilization, not effected or controlled by the laboratory.



■ **Oyster partly dissected to show important structures. The right shell and mantle have been removed, exposing: AM, adductor muscle; Au, auricle of heart; BV, blood vessel draining gills; D, digestive gland; I, intestine; M, mantle; Mo, mouth; O, oesophagus; P, labial palps ("lips"); R, reproductive organ or gonad; S, stomach; T, tentacle on mantle edge; V, ventricle of heart. (Photo courtesy of the American Museum of Natural History.)**

IN SUMMARY

There is good reason why Louisiana should investigate the possibilities of a new, larger oyster. Such an investigation is being conducted at present and a hybrid oyster has been produced in Louisiana waters as a cross-fertilization product of the Japanese species, *Ostrea gigas*, and the native Louisiana species, *Ostrea virginica.* The further cultivation of this hybrid oyster is at present being attempted, and if accomplished, the adult oyster produced will be subjected to further investigation of important matters relative to it.

As a final word in this report, it is mentioned that an investigation of the edible crab, *Callinectes sapidus*, is being conducted in an attempt to gather information relative to its growth-rate, feeding habits, and especially in an attempt to determine factors which will cause more frequent shell-moulting, for the greater production of soft-shelled crabs, prime delicacies in sea-foods.

OYSTER BREEDING AND CHARACTERISTICS

For a better understanding of some of the problems of oyster culture, an addition to this report has been thought advisable. In consequence, the writer will bring to discussion a few notes on the breeding of oysters together with some on the relative sizes and characteristics of the two species of especial interest in this oyster experiment.

The oyster is a marine animal of the group zoologists call *Mollusca,* class

Pelecypoda, order *Pseudolamellibranchiata*, family *Ostreidae*, genus *Ostrea*. This long-sentence description brings to the mind of the scientist many technical points of the animal's structure; to the layman, however, it is highly uninformative. Conveying much more would be a simple explanation such as this:

The familiar adult oyster is an animal whose home is the space enclosed by the two halves of its own shell (to which the animal is attached), found on some water bottoms about which it cannot move (because it has no power of locomotion and where it conducts its life in its own particular manner. It has the ability to open or close its shell; when it opens its shell, one of its two siphons pumps in water (from which it removes food, oxygen, water, salts) while the other pumps out water (which carries away the waste products of the animal). When it closes its shell, the oyster places an efficient armor about its soft, inner parts by which it becomes resistant to marine beasts of prey, to unfavorable changes in the water about it.

The oyster "breathes", much like a fish, by a simple exchange of gases. In the gills and in the mantles are many small, thin-walled blood vessels; the water flowing outside these blood vessels gives up some of its contained oxygen and takes on carbon dioxide, while the blood coursing within the vessels of the gills and mantles receives oxygen, rids itself of carbon dioxide. The colorless blood of the oyster is pumped through all parts of the body of the animal (including the gills and mantles) by the small three-chambered heart of the animal. The "breathing" action of the mantles, it may be mentioned, is a function somewhat secondary to their most important work—the mantles are the shell producing organs.

In addition to its respiratory function in bringing oxygen from the gills to the tissues and in ridding the tissues of carbon dioxide by way of the gills, the blood serves in many other ways, two of which may be noted: it distributes the products of digestion to all parts of the oyster and brings unnecessary and useless chemicals (results of metabolism) to the renal bodies for disposal.

CLEAN OYSTER DIET

The oyster diet is simple and, being simple, is quite clean; the almost exclusive food is diatoms, which are very small (microscopic) one-cell plants which float about in the water. From these plants and from the water, the oyster extracts those chemicals which are so important both to the oyster and to man who ultimately consumes the oyster. Phosphates and chlorides, necessary for healthy bones and teeth; magnesium salts, glycerophosphoric compounds, carbohydrates, all are found in oysters. The list includes probably every chemical element of this world. Copper and iron, the metals so important for the prevention and treatment of almost all types of anemia, are present in sufficient quantities in oysters bred in Louisiana to make possible their recommendation as an "anti-anemic" food.* Iodin, the element so widely known for its value in goiter prevention and treatment, is found in all oysters, and the Louisiana State Board of Health qualifies this statement, showing that, of all oysters tested, Louisiana oysters show the greatest iodin content:

> **Oysters and shrimp from the bedding and trawling areas of the Louisiana Coast and Bayous have been under inspection and examination for eight months. The iodin content of the Louisiana oysters, resulting from this work, has been determined:**
>
> **Louisiana oyster iodin content (average) 13,000 parts per billion.**
>
> **Louisiana oyster iodin content (maximum) 18,000 parts per billion.**
>
> **Oysters from bedding grounds other than Louisiana, iodin content 6,000 parts per billion.**
>
> **One average sized Louisiana oyster, according to these results, contains about (0.05) 5/100 milligram of Iodin.**
>
> **If the estimates of various investigators are correct, the daily amount of Iodin required in food to prevent goiter is from 1/100 to 1/200 (0.01 to 0.005) milligram of Iodin, equal to the Iodin content of about one pound of meat or two quarts of milk. In accordance with these conclusions one averaged-sized Louisiana oyster daily would supply five times the required amount. Although the Iodin content of the Louisiana oyster expressed in parts per billion seems very small as an element of diet, it is rich in material important to health . . . Louisiana State Board of Health.**

The oyster, it may be added, though classed everywhere as a "non-meat" food is, strangely enough, quite the opposite. It is an excellent source of "meat"—being more than 40% protein; in explanation it may be pointed out that such a percentage in protein is remarkably high.

In effect the oyster is a small but amazingly energetic factory of the most beneficial and health-giving chemicals man uses and needs.

To perpetuate the strain, different species of oysters may display reproductive processes peculiar to themselves. Only one of these processes will be considered here—that shown in the Louisiana and Japanese oysters. The method has been described for the Louisiana oyster with an admirable simplicity in *The Louisiana Oyster*, Bulletin No. 1 (revised by James N. McConnell, 1931):

> A most interesting fact about the Louisiana oyster is that originally it is a male, and later becomes a female. . .
>
> Oysters in this State can be found breeding from April until October and in isolated cases even during the winter months. Breeding oysters are called "milky," because of the milky looking fluid which they exude at that time. The milk of the female is composed of millions of minute eggs; that of the male, of an incalculable number of extremely small spermatazoa. A large female has been estimated to contain sixty million eggs. The milk is cast out into the water, where the sperm of the male drifts or swims to the egg and penetrates it. This act of fertilization begins the cycle of oyster life. After fertilization takes place the oyster egg divides again and again forming a ball of many tiny cells. In the course of a few hours small vibrating hairs, known as "cilia," appear on the developing young oyster. With these cilia it keeps itself suspended while being drifted about by the winds and currents. Presently this embryo develops a pair of tiny shells. These shells grow larger and heavier and finally the young "spat" drops to the bottom to attach itself to some hard object, and gives up forever its power of moving from place to place. The young spat can only attach itself to a clean surface, and after attachment while still very small it is easily smothered by sediment.
>
> The young oyster grows rapidly, and in the course of a few months, becomes a tiny male. It does not become a female until the next year's spawning season, . . . (though it) . . . may not, even then.

A little additional comment may be added.

A spawning oyster can be definitely identified as a male or a female only after microscopic examination. An extract of the gonad (sex-cell producing organ, a creamy, diffuse mass on either side of the oyster) is inspected by means of a microscope; the presence of spermatazoa in the extract indicates that the animal is a male, while the presence of eggs, of course, makes it obvious that the animal is a female.

The young oyster which survives the dangers associated with its life between the time of the fertilization of the egg

[Turn to Page 34]

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* Aside from the fact that the copper found in the adult oyster is important from the standpoint of its benefit to the life of man, the role that copper plays in the life of the oyster is an interesting one, so interesting that it deserves a special reference. In 1934, Dr. H. F. Prytherch, Director, U. S. Fisheries Biological Station, Beaufort, N. C., published the results of studies he had conducted on "The Role of Copper in the Setting, Metamorphosis, and Distribution of the American Oyster, *Ostrea Virginica.*" In this work, Dr. Prytherch discusses the effects of varying concentrations of copper upon oyster larvae; too much copper in the water proves toxic to the larvae, too little prevents their change into the attached (adult) form. How much copper would be necessary to enable (say) one hundred oyster larvae, swimming about in one quart of brackish water, to undergo the metamorphosis whereby they become attached and assume the adult characteristics? About 0.6 milligram (any range of concentration from 0.05 to 0.6 milligram per liter), an amount which one can cause to be deposited by dipping an ordinary Lincoln-head penny in the water for a period of five to eight seconds!

Louisiana Hawks are Valuable

By
James Nelson Gowanloch*

(Copyright Courtesy of Albert Dixon Simmons)

■ The Villain of the Hawk Tribe. A Blue Darter (Cooper Hawk) pursuing a Mourning Dove turns sharply in air. This photograph from FLIGHT is probably the most remarkable picture ever taken of a hawk.

Matching, in dash and grace, a military pursuit ship, a slender-winged, Blue Darter sweeps down on the planter's poultry yard and the planter has one less chicken. Poultry, being among the planter's valued assets, immediately, one more black mark is chalked up, not against this individual hawk or even against all Blue Darters, but against hawks in general, and the planter's verdict, difficult to alter, is instantly "All hawks, guilty as charged."

Such an episode constitutes one of many influences that have led to a general condemnation and foolish persecution of birds of prey, a persecution so extreme, vicious and unintelligently directed that some species of these fine North American birds have been reduced to a degree endangering even their survival. Particularly important is better understanding in Louisiana, and other States in the Deep South, of the high value of many of our hawks, since in these areas winter concentrations of hawk species occur. Persecuted in their breeding range, indiscriminately shot during their often long migrations and unmercifully hunted down in their winter home, some of these most beneficial birds of our whole avifauna have paid a dreadful price for the misdeeds of only several destructive species.

It is the purpose of this article to present in compact survey some facts concerning North American hawks, particularly species that occur in Louisiana, to enumerate the Louisiana hawk species, and to provide illustrations of the flight characteristics of all major species of North American hawks. Such illustrations, presenting, in black and white, the patterns of flying hawks, as viewed from below, enable the naturalist, equipped with prism binoculars, to identify many important species. This is particularly true since birds in flight, viewed against a bright sky, reveal little of their color while pattern is usually discernible.

Need for the presentation of such information is urgent since through misunderstanding of the biological significance of predatory birds (and of predatory animals of all kinds) the sportsman joins the planter in persecuting what he wrongly considers to be his enemies. Too common is the sight of birds, with records wholly beneficial, broad winged, so-called "Chicken Hawks", that never touch a chicken but destroy vast numbers of serious agricultural pests, shot and hung to rot along roadside fences. Some of this evil and erroneous attitude toward hawks may possibly spring from inherited European concepts of the feudal type of game preserve, a preserve sacrosanct, its population of game to be protected from anything that could conceivably impair the pleasure of his Lordship's hunt.

Biologically examined in the light of a vast mass of sound scientific evidence carefully collected and painstakingly analysed, both sportsman and planter, are alike, mistaken, and instead of serving their own best purposes they seriously damage the whole pattern of economic biological resources when they condemn and indiscriminately execute predatory birds.

The term "hawks" is used in this article in its more extended sense to include the Kites, Eagles and Vultures as well as all species with hawk as "book name."

Roughly, for present purposes, our thirty Louisiana hawks can be classified into nine "groups" as follows:

I. The American Vultures.
II. The Kites.
III. The Bird Hawks or Blue Darters.
IV. The Buteos or Mouse Hawks.
V. The Eagles.
VI. The Marsh Hawk or Harrier.
VII. The Osprey or Fish Hawk.
VIII. The Caracara.
IX. The Falcons.

Brief comments on the economic status of each group will be given.

The whole problem of the economic status of hawks is complex but can be broken down into a search for the answer to certain fundamental questions:

First, "What do hawks eat?" It is evident that different hawks have characteristic food preferences. It is also evident that different individuals of the one species and even the same individual under different conditions will behave differently as far as diet is concerned.

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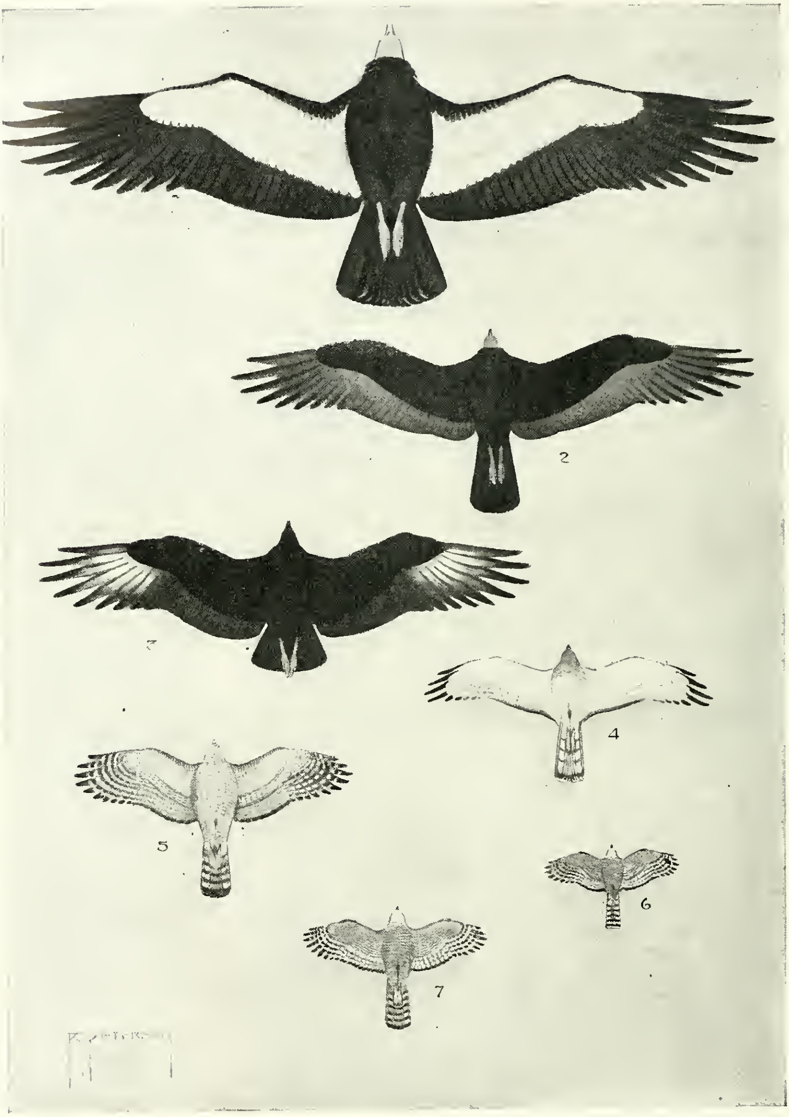
* Chief Biologist, Louisiana Department of Conservation.



(Courtesy of the National Association of Audubon Societies.)

Plate I.

Flight Patterns of North American Vultures, Marsh Hawk and "Bird Hawks."
(By Roger Tory Peterson)

Louisiana species are designated in Roman capitals. Non-Louisiana species are named in Italics.

1. *California Condor*. 2. TURKEY VULTURE. 3. BLACK VULTURE. 4. MARSH HAWK (adult male). 5. *American Goshawk*. 6. SHARP-SHINNED HAWK. 7. COOPER HAWK.

Availability of food sources, the drive of hunger under unusual stress, the presence of wounded birds or animals that normally could not be captured by the hawk, all these play their part. One of the soundest ways to gather acceptable testimony as to what hawks eat is to find what a great number of individuals of that particular hawk species actually *did* eat. The procedure, therefore, is to collect such individuals and by skillful analysis of stomach contents enumerate and evaluate food elements present in each case. Such work requires the efforts of highly specialized biologists. Such studies have contributed a broad and sound basis for our understanding of the food of hawks.

Second, "What is the effect upon the whole biological pattern of the removal from that picture of living animal materials consumed by hawk species?" This field of investigation is not easily accomplished. The structure of an animal community as a whole must be studied, evidence weighed and inter-related, and, particularly, there must be ascertained the part played by hawks in removing excess populations, in removing crippled or otherwise subnormal individuals of populations, and thus acting as a governing influence that maintains a healthy population of game or other desirable forms in good numerical adjustment with the environment. The effects of the removal by hawks of detrimental elements such as rats, mice and injurious insects must also be considered and calculated.

Experiments with various animals have clearly demonstrated that there exists a yet somewhat mysterious limiting control on the populations that a habitat can support, quite irrespective of food supply. Some undiscovered physiological effects result from over-crowding. The population that an area or habitat will normally support, and that population remain in good condition, is known as its "carrying capacity." How such limitations actually operate is yet unknown, but it is these limitations that explode amateur calculations as to how many billions of offspring a single pair of of rabbits could produce in such and such a time. Careful studies prove that in nature the ebb and flow of biological and physical forces ultimately reach this equilibrium known as carrying capacity. Thus for example Bogle (1938) shows that in Texas under most favorable conditions the Bob-white population may be maintained at seven birds per acre. Excess population disappears. Removal of this excess population is in part accomplished by predatory birds and mammals. Thus even bird-eating hawks may be beneficial in that they strike down and destroy weaker birds and permit only the more vigorous to survive. Various factors establish carrying capacity and it is obviously desirable that, since accomodation for only a certain number of birds exists in a given area, such survivors be the best adapted and sturdiest of the stock.

IMPORTANT HAWK STUDIES

One of the earliest highly valuable ornithological contributions of the United States Department of Agriculture was the volume by that distinguished ornithologist, Dr. Albert Kenrick Fisher (1893), entitled "The Hawks and Owls of the United States and Their Relation to Agriculture." Therein were presented the results of the examination of nearly 2,700 stomachs of hawks and owls. Such work has been continued through the intervening decades by a vast and steadily growing number of investigators. So true is this that Dr. W. L. McAtee (1935), preeminent authority on the food habits of North American birds, was able to publish in summary the results of the stomach examinations of no less than 5,185 individuals of hawk species alone. Dr. McAtee's paper should be in the hands of every nature lover.

Students who have access to a file of Dr. McAtee's "Wildlife Review" (see list of references at the end of this article) will find therein an invaluable guide to recent and current discussions of the whole predator problem.

The National Association of Audubon Societies, alarmed by the widespread persecution of hawks, published a volume, "The Hawks of North America," by Dr. John Bichard May (1935), which, illustrated with 37 colored plates, presents in compact fashion a survey of the economic status of all major species. Included in this volume are the admirable flight plates in black and white by Roger Tory Peterson which through the courtesy of the National Association of Audubon Societies, are herewith reproduced. It must be made clear that therein appear practically all major species of North American hawks. Names of species that occur in Louisiana are set in black-faced type under these plates. Names in italics indicate species not recorded for Louisiana.

Two exhaustive and indispensible volumes on the breeding habits, behavior and other activities of our North American hawks are provided by Dr. Arthur Cleveland Bent (1937 and 1938). Accompanied by 127 photographic plates of hawks and hawk habitats, these bulletins provide a wealth of organized and accessible data.

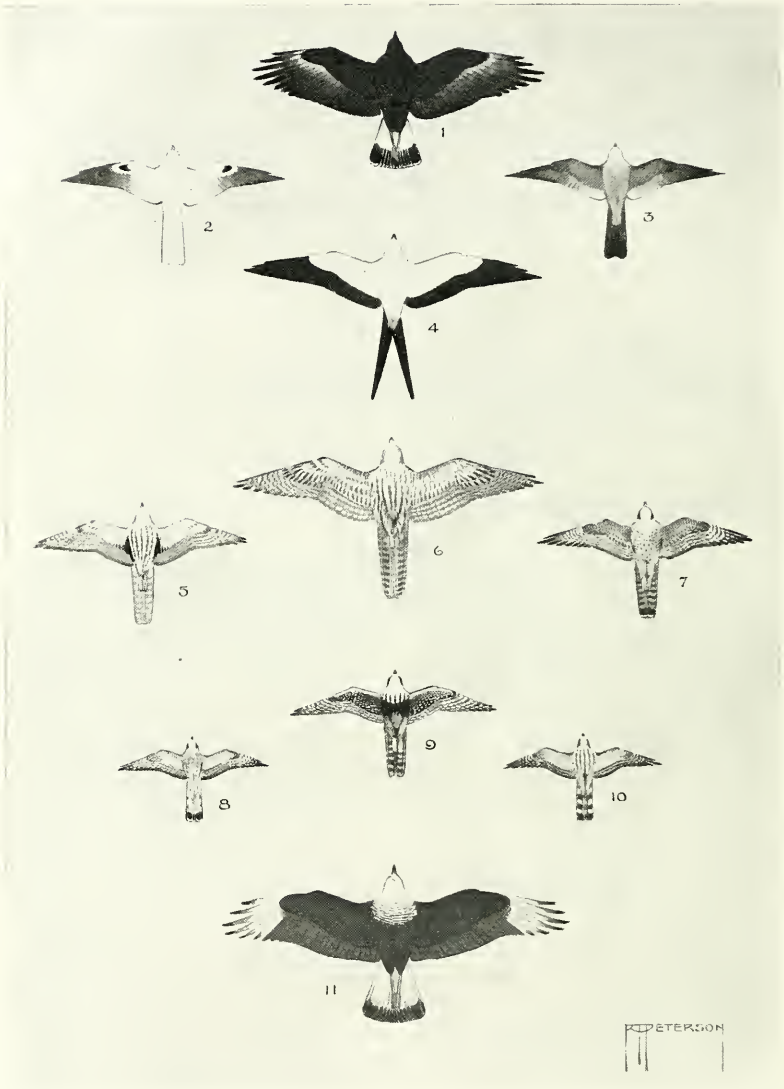
It must be realized that published information concerning hawks is almost overwhelmingly extensive but access to these five designated works will give the reader who studies them a knowledge, comprehensive and correct, of the economic status of North American hawk species.

Hawks have played important roles in religious symbolisms and mythologies of peoples from the earliest dawn of recorded history. Egyptians had hawk gods. Many North American Indian tribes included hawks in ritualistic legends or carried the dried bodies of these birds into battle as "good medicine" for skill and courage in war. Likewise from time immemorial eagles, noblest of hawks, fascinated and fired the imagination of earth-bound man, became the victorious standards of the Caesars and of Napoleon and the national symbol of our own country.

Louisiana state laws protect all hawks with the exception of the Cooper Hawk, Duck Hawk, Sharp-shinned Hawk, and the Turkey and Black Vultures. The two species of vultures, it is interesting to note, receive protection in 22 other states.

Sportsmen are selfish when they consider that the whole pattern of nature should revolve around their personal bag limit of quail or ducks and geese. There are a vast number of people interested in doing their shooting with a camera or interested in merely observing the activities of birds. Such people merit consideration equally with sportsmen. The writer remembers that sharp and peculiar pleasure experienced in seeing a Duck Hawk dash through the air with as background the majestic beauty of the Chrysler Building in the approaching dusk of a New York winter day.

Discussing one aspect of hawk raids on poultry yards May (1935) well states: "Hawks are apparently able to go for a considerable length of time without eating before they show any ill effects, and it seems quite likely that many adult hawks do not make a real 'kill' more than once in two or three days, as is indicated by the large number of 'empty' stomachs found in any large series of examinations. On the other hand, growing birds require a very large amount of food and it is during the time when young hawks are still in the nest that the greatest destruction of poultry, game and other birds takes place. Field studies, furthermore, have shown that many of the depredations on young poultry by individuals of ordinarily beneficial species of hawks are committed by inexperienced immatures which apparently have not yet become adept in supporting themselves upon the rodents which more mature birds seem to prefer. Most of the 'Hen Hawks' killed about poultry yards and game farms are young birds, less than a year old, which find young chicks in open fields very easy prey, and which have not as yet learned to avoid the habitations of their arch-enemy, Man."



(Courtesy of the National Association of Audubon Societies.)

Plate II.

Flight Patterns of North American Kites, Falcons, and Audubon Caracara.
(By Roger Tory Peterson.)

Louisiana species are designated in Roman capitals. Non-Louisiana species are named in Italics.

1. *Everglade Kite* (adult male). 2. WHITE-TAILED KITE. 3. MISSISSIPPI KITE. 4. SWALLOW-TAILED KITE. 5. *Prairie Falcon.* 6. *Gyrfalcon.* 7. DUCK HAWK. 8. AMERICAN SPARROW HAWK (male). 9. *Aplomado Falcon.* 10. PIGEON HAWK. 11. AUDUBON CARACARA.

HOW TO NAME HAWKS

May (1935) has also wisely summarized the approach to hawk identification by the amateur in the following helpful suggestions:

"Identification in the field is rendered much easier if one learns to look for certain definite characteristics first, the details of color pattern following the first or 'classifying' observations. The relative proportions between the length of the wings (the 'spread' of the flying bird) and the length of the tail, furnish a clue of primary importance and these should be studied in relation to Mr. Peterson's plates.

"If the bird under examination in flight, as is so often the case with our wary predators, note particularly these relative proportions of the spread wings to the length of the tail (or the total length of the bird); whether the wings are broad or narrow, rounded or pointed at the tips; whether there is a 'wrist-mark' or dark blotch near the bend of the wings, visible from below; whether the tail is square-ended or rounded, notched or forked, long or short, spread fan-like or held straight and closed; then of course note all conspicuous color masses. In this study of the flying hawks, compare Plate III, the buteonine hawks with their broad round-ended wings and comparatively short tails, with the narrow-winged Kites and Falcons of Plate II and the accipitrine hawks of Plate I with their short round-ended wings and comparatively long tails. After one becomes familiar with these 'group' characteristics, specific identification will be much easier.

"Note further: Is the flight characterized by alternations of brief periods of flappings and sailings; is it rapid and direct, leisurely, or a zigzag quartering; does the bird soar with widely spread and almost motionless pinions, or does it occasionally hover in one spot with rapidly vibrating wings? Certain mannerisms of flight, such as the hovering in one spot of the Sparrow Hawk as distinguished from the Sharp-shinned Hawk; a similar habit of the Rough-leg as contrasted with the Red-tail; the skimming flight of the Marsh Hawk; the angle of the wings of the Turkey Buzzard when in flight; and the slight downward curve of the wings of the Osprey, frequently make field identification possible as far as the birds can be seen.

"If the bird under observation is at rest, try to determine whether it is robust or slender of body; where the tips of the folded wings come in relation to the end of the tail (the wings of the Accipiters come to about the upper third of the tail, those of Falcons to the lower third or near the end); whether the tail is long or short, barred or plain, square, rounded or notched.

"Note the general color effect and any conspicuous masses of color. Are the under parts dark or light, streaked vertically or barred horizontally; is there a darker zone across the breast or belly; is there a conspicuous dark moustache, a light cheek, eyebrow or head, or a white area on the back near the base of the tail?

"Where was the bird seen? Sitting motionless on some tall tree or jutting ledge, circling high over woods or mountainsides, beating low across marshes or meadowlands, darting through thickets, or winging its way above a lake or river or an arm of the sea?

"When was the bird seen? Was it a summer resident probably breeding nearby, a bird passing through in migration in spring or fall, or a winter straggler from colder northern regions? Was it sunning itself at high noon or quartering the fields at dusk? All of these and similar considerations may help in establishing the bird's identity and in making its future recognition more easy.

"The largest number of closely related hawks are found in the group of buteonine or 'Buzzard' Hawks, and they are all characterized by their wide round-ended wings, rather short tails, and rather heavy bodies (see Plate III). The Eagles are very large buteonines with proportionately longer wings (see Plate IV, Figures 1 to 4). The Falcons have long narrow pointed wings and fairly long tails (see Plate II, Figures 5 to 10). The accipitrine hawks have short round-ended wings and long tails (see Plate I, Figures 5 to 7). The Kites have long narrow wings, except the Everglade Kite which has much the proportions of a Buteo (see Plate II, Figures 1 to 4). The Marsh Hawk, sole American representative of the Harriers, has long narrow wings, not as pointed as in the Falcon's, and it has a long tail, but its white rump, present in all ages and both sexes, is diagnostic (see Plate I, Figure 4). The Caracara and Osprey have characteristic outlines and are easily recognized at a considerable distance (see Plate II, Figure 11, and Plate IV, Figure 5). The Vultures are large, mostly black bird with small and inconspicuous naked heads (see Plate I, Figures 1 to 3)."

Many hawk species exhibit a peculiar biological phenomenom known as melanism, in which the normal coloration is replaced by a darker phase, so dark at times that it may become fully black. This darker or melanistic phase has no relation to the sex or the age of the individual but may, however, show greater frequency in one part of the hawk's range than in another. A good example of these peculiar color phases will be found in Figures 2 and 3 of Plate III where the light and melanistic phases of the American Rough-legged Hawk are shown. The melanistic phase of this species occurs in greater frequency in the west where melanistic phases of the Western Red-tail, the Swainson Hawk and the Ferruginous Rough-legged Hawk also occur. Naturally such dark individuals add to the difficulties of the amateur ornithologist in attempting to identify these birds in the field.

WHAT HAWKS EAT

There now follow brief commentaries on the general food habits of the nine groups of Louisiana hawks:

The Vultures live almost completely on carrion. Their activities are beneficial. Charges that Vultures transmit hog cholera have not been sustained by any valid evidence. The two Louisiana species, the Turkey Vulture and the Black Vulture, although on the outlaw list in Louisiana, receive full protection in 22 other states. Wherever undesirably heavy concentrations of Vultures occur, control of them can usually be easily accomplished.

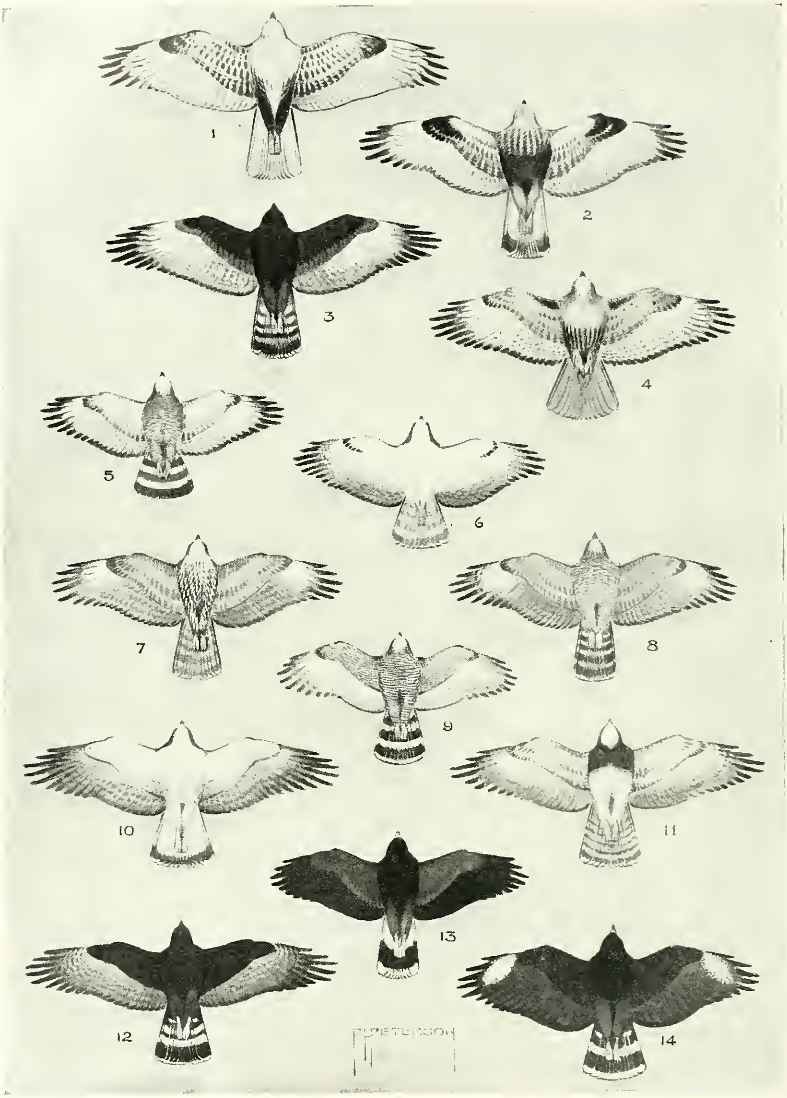
The California Condor, a species once having a wide range in the western United States, is now reduced to such meager numbers that it seems to be in danger of extinction.

Kites, among the most graceful and light of hawk fliers, exhibit long and narrow wings. They are harmless and beautiful and beneficial birds, feeding largely on insects.

Bird Hawks include the real culprits among the hawk tribe. The Cooper Hawk or Big Blue Darter and the Sharp-shinned Hawk or Little Blue Darter are crafty and ferocious killers. They typically haunt the cover of forest edges out of which they dash to secure their prey. These hawks have long, narrow tails and relatively short, rounded wings.

The Mouse Hawks or Buteos pay, more than any other species, the penalty for the Bird Hawks' activities. The Blue Darter rushes in, secures its prey and escapes, while the leisurely and often unwary Mouse Hawk gets the charge of shot the Blue Darter earned. Mouse Hawks disclose from examination of their food abundant evidence that fully establishes their value to man. Even the livelier of them, like the Red-shouldered Hawk, have been known to rear young year after year in closest propinquity with unharmed coveys of quail.

Mouse Hawks bear the worst brunt of hawk persecution chiefly because they are relatively slow flyers, fond of leisurely circling in the sky or of perching quietly for long periods on telephone poles or tree stumps. Large, often quite unsuspicious, they provide easy targets. Here belong the Red-tailed, Red-shouldered, Broad-winged, American



(Courtesy of the National Association of Audubon Societies.)

Plate III.

Flight Patterns of North American "Mouse Hawks."
(By Roger Tory Peterson.)

Louisiana species are designated in Roman capitals. Non-Louisiana species are named in Italics.

1. FERRUGINOUS ROUGH-LEGGED HAWK. 2. AMERICAN ROUGH-LEGGED HAWK (light phase). 3. AMERICAN ROUGH-LEGGED HAWK (dark phase). 4. RED-TAILED HAWK. 5. BROAD-WINGED HAWK. 6. *Short-tailed Hawk.* 7. RED-SHOULDERED HAWK (immature). 8. RED-SHOULDERED HAWK (adult). 9. *Mexican Goshawk.* 10. SENNETT WHITE-TAILED HAWK. 11. *Swainson Hawk.* 12. *Zone-tailed Hawk.* 13. HARRIS HAWK. 14. *Mexican Black Hawk.*

Rough-legged and Ferruginous Rough-legged Hawks. The short tails and the wings are alike broad. These birds usually display a dark marking at the bend or 'wrist' of the wing.

The large and heavily built Red-tailed Hawk revealed the presence of poultry in only 60 out of 754 stomachs examined. Thus, less than one individual out of 12 of this persecuted "Hen Hawk" had ever touched a hen. Meadow Mice had been eaten by 228 individuals, House Mice by 28, and other mice by 129, a total of almost half of all hawks examined having eaten these destructive little rodents. Sixty-one had taken grasshoppers, 45 other insects. As McAtee (1935) has pointed out, where poultry is not confined the Red-tail may require at times some control measures, but it is not an excessive destroyer of game birds and does consume great quantities of injurious mammalian and insect life.

The Red-shouldered Hawk takes few birds. Only eight out of 391 individuals examined had touched poultry; 82 had taken meadow mice, 59 other species of mice. A single individual had eaten nine house mice in a single meal. The species appears to be particularly fond of amphibia and reptiles since frogs appeared in 59 stomachs, toads in 19. Destructive grasshoppers were present in 94 of 391 meals, crickets in 49. As many as 46 grasshoppers were present in one individual. This bird is definitely more beneficial than injurious.

The Broad-winged Hawk, shot down unmercifully as a "Hen Hawk," seems altogether guiltless of that charge. Not one of 145 specimens examined revealed the presence of poultry. Various mice appeared in 24 meals, grasshoppers in 33, crickets in 19, such destructive caterpillars as the cutworm, sphinx caterpillar and others, in 32. The Broad-wing does almost no indirect damage to man and does much direct good.

The American Rough-legged Hawk, one of the largest of the Mouse Hawks, seems virtually guiltless as a bird killer. Only one Pied-billed Grebe, one Ruddy Duck and two smaller birds were found in 99 stomachs, and it is probable that the grebe and duck were both crippled or dead when taken. Big as it is, this species finds its chief food in mice, which appeared in 78 of the 99 stomachs examined. Few insects were taken. This bird, finding its chief fare among the injurious rodents, deserves full protection.

The Ferruginous Rough-legged Hawk closely resembles the American Rough-legged Hawk in its food habits. Examination of 17 specimens gave only two records of birds being eaten. The diet as far as studied shows a chiefly beneficial economic status for this species.

These few examples indicate the injustice of applying the name "Hen Hawk" to these slow-flying, handsome species.

Eagles are distinguished by size and noble flight, which latter differs chiefly from that of the Vultures in that they soar much less.

Both the Golden and Southern Bald Eagles occur in Louisiana. These haughty birds have, from the earliest times, aroused the admiration of man. Eagles often appear in the sensational newspaper stories wherein they are described as carrying away some infant to be devoured in the tops of lofty pines or on lonely rocky ledges. All such instances examined proved to be without basis in fact. One recent case investigated revealed that the baby, supposed to have been carried away, was actually more than 100 miles distant from the scene of the reputed yet wholly mythical tragedy.

Oberholser (1906) in his important study of these birds states: "All things considered, the Bald Eagle is more beneficial than otherwise, since much of its food is of little or no direct economic value while the good it does more than compensates for its obnoxious deeds."

McAtee (1939) states: "While an expert in flight and powerful enough to capture almost any of the forms of wildlife on the coast, the Bald Eagle is by preference a scavenger. Dead fishes and other animals it finds on beaches and mud flats are its most common food, though crippled wild fowl are soon found and dispatched and a certain proportion of living prey is taken."

It is interesting, in passing, to note that Benjamin Franklin had a low opinion of the choice of the Bald Eagle as our National Bird.

Franklin, on January 26, 1784, wrote to Sarah Bache: "I wish the Bald Eagle had not been chosen as the representative of our country; he is a bird of bad moral character; like those among men who live by sharping and robbing he is generally poor and often very lousy. The Turkey is a much more respectable bird and withal a true original native of America."

The Marsh Hawk flies low over the coastal prairies, systematically quartering the field for prey.

It is a conspicuous inhabitant of the coastal prairies ("marshes") of Louisiana. The long wings and tail and the white rump of this bird make it readily identifiable and its flight, as McAtee (1935) has pointed out, is so gull-like that light gray old males may be mistaken at a distance for gulls by the beginner.

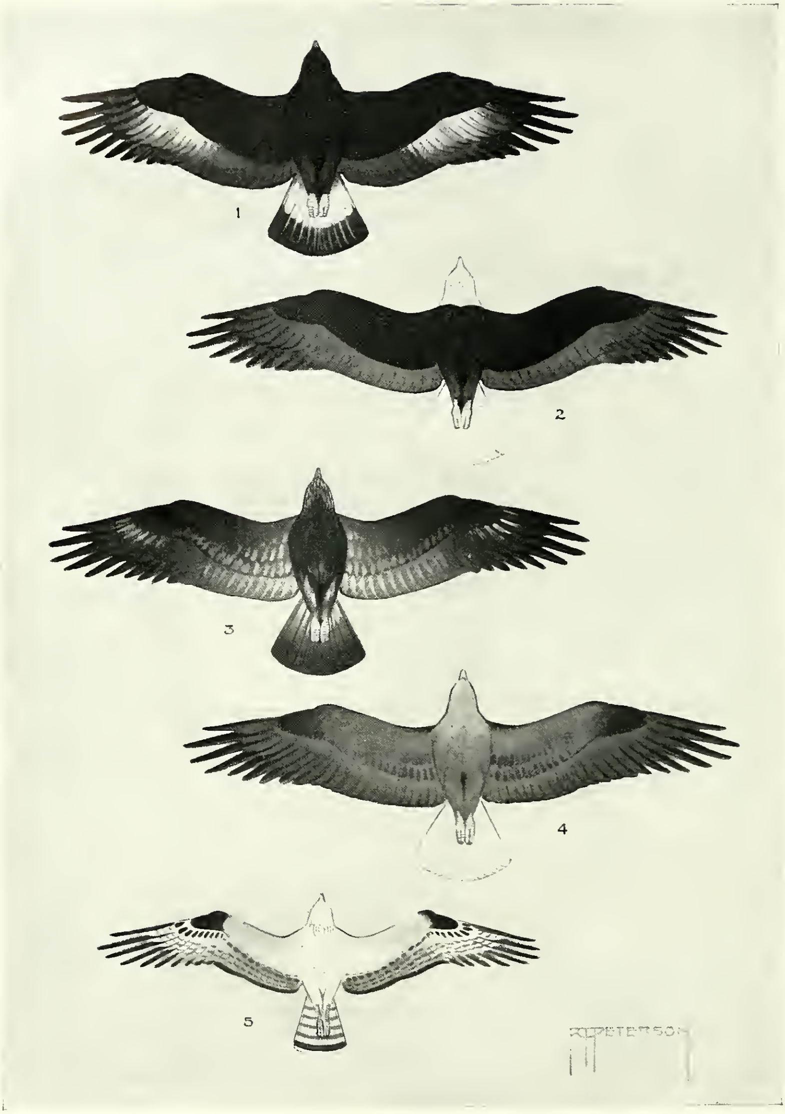
The Marsh Hawk has been charged with seriously destroying Muskrats. The record fails to prove this, for out of 601 stomachs examined only two contained remains of Muskrats. Miscellaneous birds of small to medium size were found in 205 stomachs, the most frequently occurring being members of the sparrow family. Song Sparrows were found in 62 stomachs. Rabbits occurred in 62 stomachs; mice of various kinds in 211 meals; various rats in 18. The evidence establishes that the Marsh Hawk is practically neutral in its economic status.

The American Osprey names itself by its fishing activities and usually slow, flapping flight. Its food consists chiefly of fish of no game or commercial importance. When fish are unnaturally concentrated in such situations as fish hatcheries or private fish ponds the Osprey may require control. Cottam and Uhler (1937) cite records of forty-three Ospreys collected in 14 states, the District of Columbia and two Canadian provinces, representing every month from April to October, and examined in the laboratory. Sluggish fishes formed the bulk of their diet. Only one stomach contained an important game fish—a trout. Suckers and menhaden formed by far the most important single item of food, composing nearly 43 per cent of the total.

The Audubon Caracara, closely related to the true Falcons, differs greatly from them in appearance and habits. It is the so-called "Mexican Eagle," Mexican national emblem, though no eagle at all. Walking about on its long legs, this species feeds almost entirely on carrion, therein resembling the vultures. Small rodents, insects, amphibia, reptiles, crustacea and even mammals may also be taken alive to vary its usual diet of dead materials. The Caracara, slow in movements, chiefly a bird of the ground, is neutral in economic status, but because of the unusual interest it evokes it deserves full protection.

Falcons, which include the Duck Hawk, Pigeon Hawk and Sparrow Hawk, have sharply pointed wings, rapid wing beats and graceful flight. The Duck Hawk holds the bird speed record, having been timed from an airplane during a plunge at the speed of 180 miles an hour.

The Pigeon Hawk, a bird eater, is too small to harm game. Two hundred and eighty of 727 stomachs reported by McAtee (1935) contained only bird remains. An additional 282 contained both birds and insects. The total of meals including birds was 569, of meals including insects, 430. Beneficial birds predominated, and also against the Pigeon Hawk must be charged its considerable destruction of useful dragonflies which were found in numbers of 10 or more in 389 stomachs. The remaining insects reported included many noxious species. Con-



(Courtesy of the National Association of Audubon Societies.)

Plate IV.

Flight Patterns of North American Eagles and American Osprey.
(By Roger Tory Peterson.)

Louisiana species are designated in Roman capitals. Non-Louisiana species are named in Italics.

1. AMERICAN GOLDEN EAGLE (immature). 2. BALD EAGLE (adult). 3. BALD EAGLE (immature). 4. *Gray Sea Eagle* (adult). 5. AMERICAN OSPREY.

sidering the interest that it arouses by its dashing, graceful activities and considering also its relative rarity in Louisiana, this bird should be spared.

A Louisiana Hawk record of unusual interest was established when Dr. R. W. Todd of the State Board of Health brought to the writer for identification a Pigeon Hawk bearing a Bureau of Biological Survey aluminum band and two leather leashes used on birds trained for falconry. It was subsequently ascertained that this specimen, shot accidentally by Dr. Todd on Bayou Little Caillou, Louisiana, October 29, 1939, had been banded by Richard H. Pough of the National Association of Audubon Societies at Lake Saganaga, Minnesota, April 11, 1939. This sturdy little bird had been apparently unimpeded by the presence of the leather leashes for when taken it was in excellent condition. The specimen is now in the educational museum of the Louisiana Department of Conservation in New Orleans.

The Sparrow Hawk, one of the most beautiful of hawk species, gains, from its cry, the name of Killy Hawk and, from its habit of hovering watchfully above prey, its name of Windhover. A good field mark is this species' habit of pumping its tail up and down after alighting. The Sparrow Hawk could better be called Grasshopper Hawk. Four hundred and ninety-one of 703 stomachs reported by McAtee (1935) contained remains of grasshoppers or their relatives, as many as 49 green grasshoppers, 59 brown grasshoppers and 61 crickets in three different stomachs. Only 13 out of 703 meals included Song Sparrows or their allies noted. Also in 13 instances Chipping Sparrows and their allies were present. The Sparrow Hawk on the basis of its beneficial food habits should be accorded rigid protection.

The intelligence and attractiveness of the Sparrow Hawk is well attested by E. B. Cope, cashier of the Louisiana Department of Conservation. Mr. Cope observed one of these animals in captivity for three years and relates that the bird became so great a family pet that when released from its cage it would follow him around as affectionately as a dog. The spritely behavior and lively responses of this bird were a constant source of interest and amusement.

CHECK LIST OF LOUISIANA HAWKS

The following check list shows the thirty species and subspecies of hawks recorded for Louisiana. Scientific terminology follows the A. O. U. Check-list, 4th Edition (1931). Louisiana distributions are based on the Department's bulletin "The Bird Life of Louisiana," Oberholser (1938). The division into nine "groups" is somewhat arbitrary but is provided to enable the amateur to comprehend quickly these distinctive "kinds" of hawks:

THE HAWKS. *Order Falconiformes*

Group I. The American Vultures.

Eastern Turkey Vulture, *Cathartes aura septentrionalis* Wied — A common permanent resident of general distribution over the entire State.

Western Turkey Vulture, *Cathartes aura teter* Friedmann—A casual autumn or winter visitor in central southern Louisiana.

Black Vulture, *Coragyps atratus atratus* (Meyer)—An abundant permanent resident throughout Louisiana.

Group II. The Kites.

White-tailed Kite, *Elanus leucurus majusculus* Bangs and Penard—An accidental autumn visitor to northern and southern Louisiana.

Swallow-tailed Kite, *Elanoides forficatus forficatus* (Linnaeus)—A very rare summer resident in most parts of Louisiana, more frequent in the southern part of the State, and an accidental visitor in southwestern Louisiana.

Mississippi Kite, *Ictinia misisippiensis* (Wilson)—An uncommon summer resident over practically all of Louisiana from early April to late August.

Group III. The Bird Hawks or Blue Darters.

Sharp-shinned Hawk, *Accipiter velox velox* (Wilson)—A fairly common winter resident from early October to late March in Louisiana.

Cooper Hawk, *Accipiter cooperi* (Bonaparte)—A rare permanent resident throughout the greater part of Louisiana, most frequently observed in southern parts of the State, and in winter or during migrations.

Group IV. The Buteos or Mouse Hawks.

Eastern Red-tailed Hawk, *Buteo borealis borealis* (Gmelin)—A fairly common permanent resident over practically all of Louisiana; a very rare, perhaps only casual, breeding bird.

Krider Hawk, *Buteo borealis krideri* Hoopes—A rare winter visitor in southern Louisiana.

Fuertes Red-tailed Hawk, *Buteo jamaicensis fuertesi* Sutton and Van Tyne —A casual winter resident in southern Louisiana.

Western Red-tailed Hawk, *Buteo borealis calurus* Cassin—An uncommon winter resident in southern Louisiana, late November to late February.

Harlan Hawk, *Buteo borealis harlani* (Audubon)—A rare winter resident in central and southern Louisiana, late November to mid-March.

Northern Red-shouldered Hawk, *Buteo lineatus lineatus* (Gmelin)—A winter resident of southern Louisiana from November and, casually August, to January.

Florida Red-shouldered Hawk, *Buteo lineatus alleni* Ridgway—A fairly common permanent resident in all of Louisiana where suitable timber occurs.

Broad-winged Hawk, *Buteo platypterus platypterus* (Vieillot)—An uncommon summer resident from late March to early November over most of upland Louisiana; a rare winter resident in the Gulf Coast region of southern Louisiana.

American Rough-legged Hawk, *Buteo lagopus s. johannis* (Gmelin)—A casual and perhaps at times not uncommon winter visitor in southern Louisiana.

Ferruginous Rough-legged Hawk, *Buteo regalis* (Gray)—A casual or accidental winter visitor in southern Louisiana.

Sennett White-tailed Hawk, *Buteo albicaudatus hypospodius* Gurney—An Accidental visitor in southwestern Louisiana (only one record).

Harris Hawk, *Parabuteo unicinctus harrisi* (Audubon)—A casual visitor in southern Louisiana.

Group V. The Eagles.

Golden Eagle, *Aquila chrysaetos canadensis* (Linnaeus)—A casual winter visitor, noted mostly in autumn in southern Louisiana.

Southern Bald Eagle, *Haliaeetus leucocephalus leucocephalus* (Linnaeus)—A permanent resident over most of Louisiana, fairly common locally in southern Louisiana, not common in other parts of the State.

Group VI. The Marsh Hawk or Harrier.

Marsh Hawk, *Circus hudsonius* (Linnaeus)—A common winter resident from mid-September to late April, casually to late May throughout Louisiana; most numerous in coastal marshes.

Group VII. The Osprey or Fish Hawk.

American Osprey, *Pandion haliaetus carolinensis* (Gmelin)—A rare permanent resident in practically all of Louisiana, more frequently observed in southern Louisiana, now apparently less numerous than formerly.

Group VIII. The Caracara.

Audubon Caracara, *Polyborus cheriway auduboni* Cassin—A casual visitor to the coastal region of southern Louisiana from the Mississippi River to Cameron Parish; no breeding record for Louisiana available, although the species has been reported for all seasons of the year.

Group IX. The Falcons.

Duck Hawk, *Falco peregrinus anatum* Bonaparte—A rare winter resident from late October to early May in most parts of Louisiana, more frequently seen on the Gulf Coast region; no breeding records for the State.

Eastern Pigeon Hawk, *Falco columbarius columbarius* Linnaeus—A rare winter resident from mid-September to early May in the coastal region of southern Louisiana, most frequently noted in the immediate vicinity of the Gulf Coast along the Mississippi River below New Orleans.

Western Pigeon Hawk, *Falco columbarius bendirei* Swann—A rare winter resident from late September to mid-March, casually to early June, in southern Louisiana.

Eastern Sparrow Hawk, *Falco sparverius sparverius* Linnaeus—A winter resident from early August to late February, and accidentally to late June, over probably all of Louisiana.

Little Sparrow Hawk, *Falco sparverius paulus* (Howe and King)—A common permanent resident throughout Louisiana except in the immediate vicinity of the coast of the Gulf of Mexico; breeds from April to June.

GAME MANAGEMENT RESEARCH

It is of interest to review certain recent results of game management research and allied studies. In the following paragraphs will be presented some few of the valuable findings of such investigations:

Claycomb (1938) has emphasized, referring to Louisiana conditions, the essential importance of protection cover and nesting cover for quail in maintaining good quail populations. He adds: "Undoubtedly the greatest single factor in quail reduction is improper methods of hunting. Hunting destroys the strong as well as the weak birds and killing takes all, leaving nothing as a basis for the next year's crop." This is in sharp contrast to the action of natural predators which by reason of their own limited abilities are usually able to capture only the weaker individuals.

Leopold (1936) has described how in Germany, predators exposed to intensive control over much longer periods than in the United States, have become scarcer than in our country. As the result of a better understanding of the beneficial role played by predators in the maintenance of good game stocks a definite "predator restoration policy" has become necessary to produce best game conditions.

Dymond (1934) in an instructive study of the part played by predators in relation to cycles of abundance and scarcity in animals, concludes that in the absence of predators the population faces food shortage and the prevalence of disease. He concludes: "It is impossible to eliminate the predator without ultimate injury to the health, vigour, and other desirable qualities" of the species concerned.

Hamerstrom (1936) conducted an illuminating study of 503 Ring-necked Pheasant nests covering three breeding seasons. Correlating the reproductive success or failure with varying physical and biological factors in a total of 445 nests under regular observation he found a 76.9 per cent failure. Hamerstrom's analysis of the cause of these failures is highly instructive since he concluded that man was a factor in 52.3 per cent, predators (of all kinds except man) in 19.3 per cent, abandonment 3.5 per cent, flooding 5.8 per cent, total lack of cover 0.9 per cent, unexplained 18.1 per cent. Thus even a 100 per cent successful program of "vermin" control would have affected only one-fifth of the total nests, without taking into consideration at all the part certain of these "vermin" themselves play in controlling undesirable biological elements of the environment.

Kennedy (1936) quotes a striking example from Handley of the folly of "vermin" control by bounty payment: "The expenditure in Virginia of $348,325 for the taking of 695,653 hawks, owls and crows over a six-year period, 1924-29, may have saved some quail, but I am of the opinion that had the same amount of money been expended on lespedeza seed for distribution more would have been accomplished. Furthermore, since the payment of bounties has been stopped, quail have continued to increase and are now more abundant than at any time when bounties were paid." This would seem to provide a practical, convincing example of the truth that "vermin" bounties do not result in better game.

Wooster (1938) attempts to estimate the toll of predators on the basis of individual food requirements in terms of numbers of predator individuals per square mile and duration of time they are present. Using these methods he arrived at many highly interesting conclusions. For example: "The normal food importance of the Marsh Hawk, expressed in avoirdupois weight is 494 pounds, or almost one-quarter ton. In terms of meadow mice, the Marsh Hawks on one square mile would require 16 mice per day or 5840 per year."

Leopold (1939) gives a brief but broad and valuable discussion of game-predator relations, emphasizing the interdependence of biological resources and showing that moderate losses, where due to hunting or predation, have no effect on average populations: "In predation, however, there is some kind of automatic adjustment that tends to keep losses moderate. I wish we could claim the same for gunpowder."

Bond (1939) discusses a case where within a year the hawk population of a given locality was reduced 75 per cent due, in part, apparently to a lessened food supply of rodents and, in part, possibly to botulism. This is evidently an instance of automatic natural adjustment of predators to the existing biological pattern.

Errington and Hamerstrom (1936), aptly and concisely, describe the biological balance of predation and carrying capacity: "It seems entirely reasonable to suppose that predation is a natural phenomenom associated with life, reflecting the reaction of hungry creatures to the food which happens to be the most available. . . .

"Over-populations generally are conspicuous targets for attacks by predators or parasites. Nature may abhor a vacuum, but she abhors over-population not a great deal less. Someone has said that Nature has more than one arrow for her bow. Over-populations are insecure because they are over-populations. If they are not reduced by one thing they are reduced by another."

Beadel (1939) in his valuable paper concludes from a life-long experience as a quail hunter and preserve owner that normal quail are killed by hawks far less often than is generally believed. The quail taken are often sick or crippled birds whose elimination, from the point of view of maintaining good game stock, is desirable. Furthermore, many of the rodents and snakes killed by the hawks are themselves dangerous quail enemies whose destruction serves to save more quail.

Beadel goes so far as to say that if the hunter cannot distinguish the Blue Darters (the Cooper and Sharp-shinned Hawks) he had better leave all hawks alone because such action will gain him greater benefit in the end. Provision of plenty of available cover vastly aids quail in escaping from even the swift Blue Darters. His succint conclusion is trenchant and notable: "My experience indicates that the above-average quail population cannot only be maintained, but is more easily maintained by leaving hawks unmolested than by killing them."

Lagler (1939) in a study of predator control in 229 fish hatcheries over 38 states concludes: "Of the several control methods reported, screening and wiring of ponds and raceways and shooting and trapping of predators afforded the greatest protection. Wider use of controls that do not involve the wholesale destruction of actual or supposed predators is recommended."

Pough (1939) points out that when predators are over-controlled and their numbers too greatly reduced their "sanitative" value in maintaining good game stocks is diminished without anything becoming available to replace their influence.

Bradbury (1937), discussing game management investigations in Massachusetts, states that "in general the best predator control is obtained by providing escape cover as an integral part of the feeding grounds. There are no bounties except for wildcats. Where we have eliminated Red-tailed and Red-shouldered hawks, the less desirable Cooper's Hawk has come in. After observing a Red-tail kill a Cooper's Hawk immediately after it had been placed in the same pen, the experiment was tried to encouraging the Buteos in the wild."

Pough (1938) pleads the hawks' case well when he states that they, so long a colorful part of the North American wildlife picture," have as much natural right to a place in the woods and fields as any other native bird or mammal." Their value in interest to the nature student represents an important asset additional to the role they play as beneficial destroyers of rodents and insects and as "sanitive" agents in maintaining the equilibrium of game populations.

Abbott (1940) writes: "Experts on quail-raising as widely separated as California and Georgia are agreed that increased hawk population means increased quail supply."

McAtee (1935) clearly expresses in few words the common origin of "snap judgment" on hawks: "Opinions about the utility of hawks usually rest on relatively few observations. A hunter once in his life may have flushed a hawk from a recently killed game bird, or a farmer may have been pestered one spring by a pair of nearby nesting Blue Darters; thereafter they see nothing but evil in hawks. While these personal experiences leave strong impressions, they should not be allowed to exclude reasoned consideration of other evidence.

"When stomach analysis reveals that only one quail was represented in a total of 391 meals of Red-shouldered Hawks, hunters' recollections of the capture of quail by these hawks should in justice be given their true value, namely as unusual happenings, not at all a fair basis on which to formulate a policy toward the species. Similarly, the fact that examination of 145 stomachs of Broad-winged hawks revealed no traces of poultry should indicate to the farmer the desirability of identifying hawks before taking summary action, and of sparing the broad-winged and other hawks of equally blameless habits."

CONCLUSION

The foregoing survey of Louisiana hawks is, by reason of space limitations, far, indeed, from complete, but it is hoped that it will bring to the attention of *Louisiana Conservation Review* readers some clearer knowledge of the truth that hawks should not be killed on sight. Testimony has been presented showing that even life-long quail hunters, close students of game conditions, have come to the conclusion that "Hands off all hawks" is the best, most productive policy.

Subjects of deepest interest to the nature lover, hawks, bold and dashing or stately in slow soaring flight as the various species may be, fill in nature a role, complex and important. Their destruction not only removes from the scene fascinating biological elements but also profoundly upsets the balance of nature and wreaks deep harm in terms of damage to human economic interests.

Certainly hawks should be killed, should be shot on sight when they raid the poultry yard, but it is the individual chicken thief that must be executed and not the slower, often wholly beneficial, hawks that may later appear on the scene, to meet an unjust and fatal reward.

If the reader gains some elementary knowledge of the existence of the nine hawk "groups" as given above and becomes able to distinguish at least some of these birds in the field, he will presently discover that, as his own observations continue, he acquires a constantly more convincing volume of evidence that hawks, maligned and cruelly persecuted, merit from planter and sportsman alike careful study and adequate protection.

It is only by the spread of such knowledge, leading to a better understanding of hawks and their many values, that the accelerating decrease of some of these beautiful Louisiana species can be arrested and their survival assured.

Sportsman and planter, Louisiana hawks are valuable!

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HOT FISH

Illegal fishermen often employ great ingenuity in taking their ill-gotten gain. For instance, a common trick is to grind up walnut shells and load them in gunny sacks, which are placed in streams. The ground-up shells liberate a toxic poison which stuns the fish so they can easily be scooped up.

In some parts of the country, nets made from gunny sacks are stretched across the narrow part of a stream. Fish are then driven into the nets by the fisherman as he approaches the net, splashing downstream.

WILD VALETS

The Custer wolf, one of the most notorious of animal outlaws, once had two servants. A few weeks after his mate died, two coyotes attached themselves to the wolf that plagued Wyoming stockholders for years until he was finally exterminated by a Government hunter.

These coyotes flanked all the Custer wolf's movements, giving warning of danger. When he ate, the coyotes hung back and waited until he had finished, before devouring what was left of the prey.—*From The American Wildlife Institute.*

Preliminary Report...

[Continued from Page 22]

from which it springs up to the time of its attachment grows to the best of its ability on the oyster bottom where wind, tide, and chance have caused it to be placed. If the oyster bottom enjoys a constant exchange of water well laden in food and in proper chemical constitution, the oyster becomes large and fat and, in time, is usually harvested by the oyster fishermen. If the oyster bottom is not in the best of locations, and if the water is not of the best composition, the oyster growth will be greatly influenced by this poverty of quality—the oyster will be small, not fat and not of the best taste. An oyster in such a condition is of little commercial value to oyster fishermen and must be transferred to a good bedding ground for proper growth.

TO INSURE THE OYSTER'S QUALITY

Nor is this the only step taken by the oyster fishermen to insure quality. Oysters are usually found not singly but in clusters; being so close together they will not develop as well as they could. The oyster-fishermen, therefore, break up the clusters, replace the single individuals, which then show much better growth. Shell-planting is another task of the men who work to keep the world supplied with these tasty and health-giving animals. Before the attachment of the young spat, the agents of the State of Louisiana, with the help of some of the oyster fishermen, see to the planting of many barrels of clean shells for the reception of the new oyster seedlings—the oyster crop of a future year. Without the clean surface offered by these shells, the young spat would fall in the bottom mud to be smothered. After the oysters are growing for a time, they may be spread out, the bunches separated, the individuals given a chance to develop quickly and well.

Despite these hardships enforced by nature upon the Louisiana oyster-fisherman (and upon every oyster-fisherman), there are at least two important and little-recognized benefits enjoyed by the Louisiana oyster men which are of extremely great importance. The mildness of the climate makes year-round work possible; there is no prolonged interruption in work because of benumbing subzero cold. And the extended spawning period of the Louisiana oyster, together with the favorable combination of factors in the water making the life of the young a relatively easy one assures a yearly set of spat which is quite adequate for the demand.

In seeking some point of difference between the Louisiana and the Japanese oyster, the most striking distinction is readily seen to exist in the weight and thickness of the shell. Even at an early age the shell of a Louisiana oyster may be observed as thicker, heavier than that of the Japanese oyster; as time goes on the difference becomes even more noticeable.

DIFFERENT GROWTH RATES

The difference in shell thickness shown in the two species may possibly find its explanation in the different growth rates. The Japanese oyster, growing rapidly, has not time for the formation of a thick, heavy shell; conversely, of course, the Louisiana oyster, developing more slowly, builds up a heavier shell. Whether or not the thinness of shell makes the Japanese oyster less resistant to oyster pests cannot be stated positively.

The thinness of shell does one striking thing, however; it influences the very important ratio of meat to shell. The oyster canneries are interested, of course, in the yield in number of cans of a barrel of oysters. A barrel of thick-shelled oysters may yield fifteen to thirty cans of oyster meat; a similar barrel of thin-shelled oysters would show a greater yield—twenty-five to forty cans of oyster meat. The difference is obviously significant and demonstrates, in one way, the reason behind the present oyster investigation. The thin-shelled Japanese oyster shows a ratio of more meat per shell than the Louisiana oyster and, consequently, yields more oyster meat per barrel than the Louisiana oyster. In addition to the reduction in the time of culture, then, the rapid growth characteristic of *Ostrea gigas* effects another desirable condition—an increase in amount of meat per oyster.

There is one unfortunate characteristic of the Japanese oyster (in addition to its unfortunate lack of taste) which is of sufficient interest to be mentioned. In the can it often assumes a greenish tint, which, together with the black or brown fringe along the margin of its mantle, constitutes a color picture which is not appetizing.

It may easily be seen, then, why Louisiana has not considered the introduction of the pure Japanese species into its waters: The possibility of the introduction of parasites, the lack of taste of the animal, the undesirable coloration of the canned oyster. On the other hand, the species *Ostrea gigas* demonstrates some qualities not possessed by the Louisiana species *Ostrea virginica*—rapid growth to a large size and a thinness of shell which increases the yield in meat. Hoping to abstract the best qualities of the two species (the size, growth-rate, and shell-thinness of *Ostrea gigas* and the taste, quality and texture of *Ostrea virginica*), experimental work is being conducted whose results will no doubt be of very great interest and economic importance.

Progress of Ground Water Investigations in Louisiana

By

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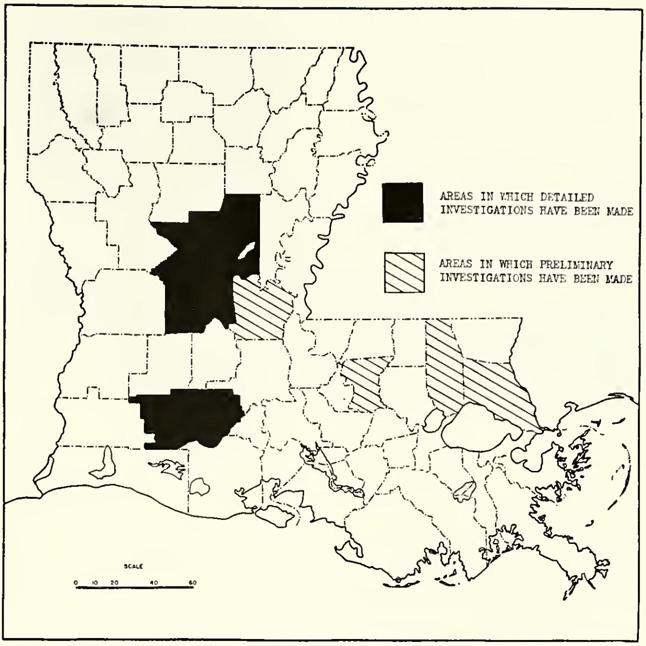
AREAS IN WHICH DETAILED INVESTIGATIONS HAVE BEEN MADE
AREAS IN WHICH PRELIMINARY INVESTIGATIONS HAVE BEEN MADE
SCALE
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■ **Figure 1. Map of Louisiana showing parishes in which ground-water investigations are in progress.**

An investigation of the ground-water resources of Louisiana by the Geological Survey, United States Department of Interior in cooperation with the Geological Survey, Louisiana Department of Conservation has been in progress since May, 1938. The first year of this work is briefly described in the 1939 Spring number of the Louisiana Conservation Review. The present article includes a brief statement of definitions and general methods of investigation along with a report on the progress of work during the past year.

Plans were originally made, as stated in the Thirteenth Biennial Report of the Department of Conservation,[1] "to conduct ground water investigations throughout the State on a continuing cooperative basis until the entire State has been covered in a systematic manner, and to undertake, first, the investigations in those areas in which ground water problems are pressing for immediate solution, or in which it is anticipated that there may be, in the near future, a considerable development for which there is need for ground water supplies. Continuing investigations of this character are regularly a part of the work of the United States Geological Survey and the various state geological surveys, and such studies have been in progress in other states for a number of years. The proposed program is in accord with the general plan of operation of the Louisiana Department of Conservation in its program of conserving and developing the natural resources of Louisiana." Under the provisions of this cooperative agreement, detailed investigations were begun in Rapides Parish and extended into Grant, La Salle, Jefferson Davis, and Acadia Parishes. (See Figure 1) Preliminary work has been done in Avoyelles, East Baton Rouge, St. Tammany and Tangipahoa Parishes.

GENERAL DEFINITIONS AND METHODS OF INVESTIGATION [2]

A portion of all the rain that falls on the surface of the earth percolates downward through surficial materials until it finally reaches a zone in which the rock is completely saturated. The water in this saturated zone is the body of ground water. The gently undulating surface of this body of ground water is known as the *water table*. The water table follows the topography, in general, being at a higher altitude in the hill land than in the low land (See figure 2). The movement of the ground water is always in the downslope direction of the water table toward the lakes and streams in which it may emerge at the surface.

In some regions inclined permeable formations are underlain by relatively impermeable beds. Water falling as rain upon the beveled outcrop or intake areas of these permeable formations percolates downward until it becomes confined between the inclined impermeable beds. Further percolation is restricted to lateral movement in the conduit and the water is under what is termed *artesian pressure*. The water in a well penetrating this reservoir at any locality that is structurally lower than the intake area will rise in the casing (See figure 2). Such a well may be called an *artesian well* whether or not the pressure is sufficient to cause it to overflow at the surface. Theoretically the water should rise to the same level as the intake area; however, the losses of pressure due to friction and leakage cause the pressure head or static level to diminish with the distance from the intake area. An imaginary surface that everywhere coincides with the pressure head or static level of the water in the aquifer is termed a *piezometric surface*, and a map depicting the configuration of this piezometric surface, by means of contour lines that pass through points where the static level is at equal altitudes above or below a given datum, is known as a *piezometric map* (See figure 3). It is by these maps that the discharge and recharge areas, the direction of movement of the ground water, and the effects of pumpage may be determined.

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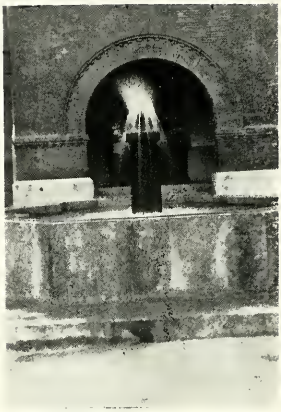
[1] Thirteenth Biennial Report, Department of Conservation, State of Louisiana, p. 133, 1936, 1937.

[2] After Meinzer, O. E., Outline of ground water hydrology: U. S. Geol. Survey Water-Supply Paper 494, 1923.

Ground-water investigations may be divided into two principal types: systematic areal surveys and special investigations. The common units in a systematic areal survey are the counties or parishes, although physiographic units such as valleys and drainage basins have been used. Reports on such surveys are usually confined to the general occurrence and character of the ground water with little discussion of quantitative problems. The special investigations are generally more intensive and detailed in character, involving the practical application of hydraulic principles to the water supplies of centers of population and industry, or areas of extensive irrigation, where ground water is being withdrawn from wells in such large quantities that the problems of overdraft and safe yield have become serious. Such quantitative studies, according to Meinzer[3], "involve for each formation and each area the problems of the quantity of water in storage, the proportion of the stored water that can be recovered through wells, the average rate of natural intake or recharge, the proportion of the recharge that can be recovered through wells, the effects of the withdrawals through wells upon water supplies derived from natural discharge of ground water, the extent to which the rate of recharge can be increased, and the effects of artificial methods for recharge upon the surface water supplies."

The observation of the static levels or pressure heads of various wells constitutes an essential part of all ground-water studies. These observations are made in several different ways. Individual measurements are made by use of a steel tape graduated in hundredths of a foot. On flowing wells in which the water does not rise above six feet, a garden hose is attached to the well by utilizing pipe fittings and soil-pipe test plugs, and the static heads determined by direct measurement of the height at which the water stands in the hose. On flowing wells with higher pressures the head may be determined by attaching a pressure gage to the well. In some instances water level recorders are installed which give continuous graphic records of the fluctuations of the water. The altitude of the measuring point on the various wells is then obtained by precise levels, aneroid traverses, or topographic maps, depending upon the accuracy needed. This allows the reference of all water level measurements to one datum so that they may be compared or shown on piezometric maps.



■ Figure 4. Artesian well at Colfax flowing salt water and gas. The gas is ignited giving the appearance of burning water.

RAPIDES PARISH[4]

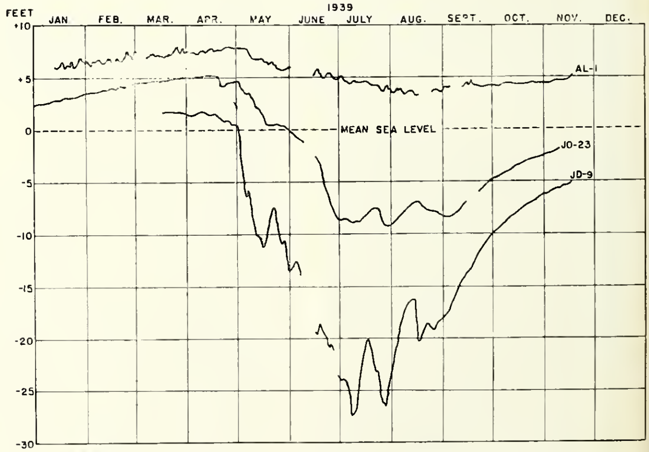
Ground water constitutes the principal source of water used in Rapides Parish, supplying six municipal systems and many domestic supplies. It is obtained from wells that yield water from sands of Miocene age and the overlying formations of the Pliocene (?),[5] Pleistocene, and Recent.

The formations of Miocene age consist primarily of alternating sands, clays, and shales that dip regionally southeastward at the rate of 50 to 100 feet to the mile. Locally the formations dip from the highlands on both sides of the Red River flood plain toward the center of the valley, forming a synclinal trough which extends from a point a few miles southeast of Lecompte to a point northwest of Zimmerman. This feature is responsible in part for the flowing wells along Bayou Rapides.

Sand, gravel, and clays of Pliocene (?), Pleistocene, and Recent age overlie the Miocene formations in most of the Parish. The sediments of Pliocene (?) age are found in the highlands and the Pleistocene and Recent are found in the lowlands along the main streams. In general, all of these materials thicken southeastward.

Sands of the Miocene formations contain water under sufficient artesian pressure that wells penetrating these sands flow in some areas of Rapides Parish (See figure 3). The principal recharge of the Miocene sands, as shown by the composite piezometric map of Rapides Parish (figure 3), occurs in the highlands to the north and west where the sands lie at or near the surface. Static levels of the water in wells penetrating the Miocene sands in various parts of the Parish range from 24 feet above the surface to 130 feet below the surface depending upon the topography and proximity of pumping wells.

Water in the Pliocene (?), Pleistocene, and Recent materials may or may not be under artesian pressure. Water-table conditions are usually found in the shallow wells, ranging from 20 to 50 feet in depth. The water of the deeper wells ranging from 50 to 160 feet in



■ Figure 6. Graph showing influence of pumping on water levels of Wells AL-1, 1 mile east of Elton; JD-9, 1½ miles west of Roanoke; and JD-23, 2 miles southeast of Iowa. The low water levels during the Summer were due to the heavy pumping in that season.

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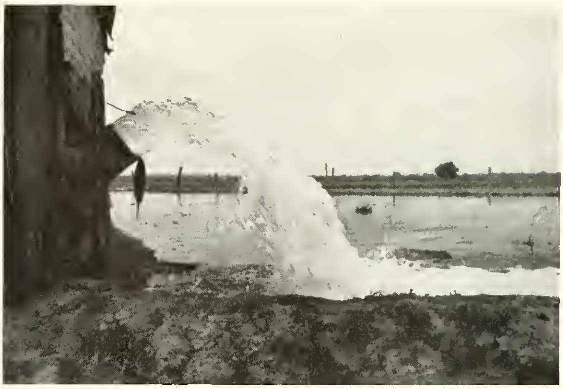
[3] Meinzer, O. E., Ground water in the United States, a summary: U. S. Geol. Survey Water-Supply Paper 836-D, pp. 204, 205, 1939.

[4] Briefly discussed in Spring Issue of Louisiana Conservation Review, p. 36, 1939.

[5] Referred to lower Pleistocene by Fisk in a geological report on Rapides Parish now in preparation.

depth usually rises a considerable distance in the casing and may overflow in areas of low altitude.

The principal industrial and municipal supplies are derived from deep wells penetrating Miocene sands. These sands yield water which is soft and usually has a relatively high content of sodium and bicarbonate, and a large total of dissolved solids. A small amount of fluoride has been found in most of this water, but this amount is generally within the limits set by the U. S. Public Health Service. The water levels of these Miocene sands have declined considerably with a relatively small amount of pumpage indicating that, although the quantity of water from these sands is generally sufficient for the present-day needs, increased demands in the future may necessitate the use of water from other sources.



■ Figure 5. Irrigation well near Church Point in Acadia Parish, pumping about 2000 gallons a minute.

Most of the rural wells in the highlands of the Parish penetrate shallow sands of the Pliocene (?). These sands yield soft water with a small total of dissolved solids. The quantity of this water available varies considerably with the locality but seems to be adequate for domestic and livestock purposes.

Large quantities of shallow water are available from the Pleistocene and Recent sediments present in the lowlands of the Parish. This water is hard and contains considerable amounts of iron. In the vicinity of Catahoula Lake in the northeastern portion of the Parish, the mineralization of this water is large enough to render the water unsatisfactory for domestic or public use.

Detailed results of the areal survey of the ground-water resources of Rapides Parish have been embodied in a report entitled "Ground-Water Resources of Rapides Parish, Louisiana" which is being published as a Geological Bulletin No. 17 of the Department of Conservation. Though a section of this bulletin is devoted to the municipal supply of the City of Alexandria, a separate report of a quantitative nature will be prepared after adequate observations over a period of years have been made. With this in mind, five automatic water stage recorders are in operation on wells in Alexandria at the present time, and observations of key wells in the Parish are being continued.

GRANT AND LA SALLE PARISHES

Potable ground water is obtained in Grant and La Salle Parishes from wells that range from 15 to 615 feet in depth. The principal aquifers are the sands of the Cockfield formation of Eocene age and Catahoula formation of Miocene age, and the overlying Pliocene (?),[6] Pleistocene, and Recent sediments, all of which dip and thicken southeastward.

The Cockfield formation, which crops out in northern Grant Parish near Montgomery and Packton, and in the northwestern corner of La Salle Parish, is composed of about 500 feet of light gray and brown lignitic silty clays, silts, and sands with small layers of lignite. The sands yield fresh water only in a limited area in northwestern La Salle Parish, a few miles south of the outcrop. The water in the Cockfield sands is under artesian pressure except in areas in which the sands lie at or near the surface. The only well having sufficient pressure to flow at the surface is the salt water well in front of the court house in Colfax (See figure 4). This well was reported by Veatch[7] to be 1128 feet deep and to have had an artesian head of 65 feet and a flow of 40 gallons a minute in 1900. The well flowed salt water and gas continuously from 1899 to about 1937 when it became necessary to pump the sand out of the well to start the flow. The small amount of gas discharged with the salt water is usually kept burning as long as the flow continues.

Cockfield sands supply water to the towns of Olla (and Standard), Urania, and Tullos, and a few private industries in La Salle Parish. The hardness of seven samples of water from the Cockfield formation ranges from about 5 parts per million to 164 parts per million. Some of the water is reddish in color and has not been used for cooking and drinking purposes for that reason. Toxic quantities of fluoride have been found in some of this water. As discussed in Geological Pamphlet No. 1 of the Department of Conservation,[8] fluoride in water is associated with the developmental tooth defect known as mottled enamel. The data concerning the quality of water will be available to the public in the final Parish report.

The Catahoula formation, which underlies southern Grant and southeastern La Salle Parish, consists of alternating sands, clays and shales. The deep wells penetrating the Catahoula water sands range in diameter from 2 to 4 inches and in depth from about 150 to 500 feet. The water in these wells is under artesian pressure and overflows at the surface in the Red River Valley between Boyce and Colfax, and near Big Creek in the vicinity of Pollock and Fishville. The artesian pressure of these flowing wells ranges from a fraction of a foot to 15 feet above the surface (about 94 to 112 feet above mean gulf level); the higher pressures being present in the wells near Boyce. The yield of the wells ranges from one to 6 gallons a minute.

No large municipal or industrial supplies have been developed from the Catahoula formation in these Parishes. This is due in part to the slightly brackish character of the water in the Red River Valley and in part to the fact that the Catahoula formation is usually blanketed in the highlands with younger sands and gravels that yield water of better quality. The water from the Catahoula sands is soft and generally has a large bicarbonate content and a large total of dissolved solids.

Pliocene (?) sands and gravels blanket the highlands of these Parishes as they do in Rapides Parish. They range in thickness from a few feet to over 120 feet and generally yield sufficient water for small municipal and industrial supplies where the formation is over 50 feet thick. Because of the shallow depths of the water sands, there are more wells drawing upon this source than on any other in this area.

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[6] Referred to lower Pleistocene by Fisk, H. N., Geology of Grant and La Salle Parishes: La. Dept. Cons. Geol. Bull. 10, pp. 149-172, 1938.

[7] Veatch, A. C., (with introduction by G. D. Harris) Underground water resources of Northern Louisiana; Geol. Survey of Louisiana, Bull. 4 (Report of 1905), pp. 144, 145, 1906.

Veatch, A. C., Underground water resources of north Louisiana and southern Arkansas; U. S. Geol. Survey Prof. Paper 46, pp. 210, 211, 1906.

[8] Maher, J. C., Fluoride in the ground water of Avoyelles and Rapides Parishes, Louisiana: La. Dept. Cons. Geol. Pamphlet No. 1. 1938.

Pleistocene and Recent sediments ranging from a few feet to about 130 feet thick cover the lowlands of the Parish, such as the Red and Little River Valleys, and the swamp land near Catahoula Lake. These sediments, as in other parts of the State, yield hard water which contains a rather large amount of iron. This water is slightly brackish in the vicinity of Colfax.

A report based on the field work in these Parishes in 1938 and 1939 is being completed at the present time. This will deal mainly with the occurrence and quality of ground water with especial reference to the municipal supply at Colfax. Observations will be continued on key wells in this area and will be published each year along with observations on key wells in other areas in the Louisiana section of "Water Levels and Artesian Pressures in Observation Wells in the United States", a Water-Supply Paper of the Federal Survey.

JEFFERSON DAVIS AND ACADIA PARISHES

The rice-farming region of southwestern Louisiana, consisting principally of Jefferson Davis and Acadia Parishes, is underlain by sands, gravels, and clays deposited during Pleistocene time as a part of the Mississippi River delta. A formation consisting of about 80 feet of relatively impervious clay is present at or near the surface and is underlain by thick beds of sands and gravels which yield large quantities of hard water. The surficial clay forms a tight subsoil which prevents seepage losses in the irrigation of rice and serves as a confining bed for the underlying water-bearing sands and gravels. The sands and gravels dip southward from Allen and Evangeline Parishes, where they are present at or near the surface. Water falling as rain on these permeable materials percolates downward until it is confined beneath the surficial clay and moves to the south under artesian pressure. This pressure is sufficient to cause the water in wells in southern Jefferson Davis and Acadia Parishes to stand within a few feet of the surface. Due to the higher altitude in the northern part of the area, the water levels there are usually 45 feet or more below the land surface.

Approximately 375 irrigation wells have been drilled in these Parishes. The general drilling practice is to set a 24-inch steel casing or pit to a depth of 60 to 80 feet and drill the well, ranging from 8 to 16 inches in diameter, inside the pit to a depth of 250 to 300 feet. The well is usually finished with 80 feet of screen. A centrifugal pump is installed at the bottom of the pit, about 40 feet below the water level. Diesel or electric power is ordinarily used to operate the pump, although a few steam engines are still in operation. The yield of these wells ranges from 1000 to 4000 gallons a minute (See figure 5).

According to an estimate based on data compiled by the Louisiana State Department of Agriculture and Immigration,[9] 500,000 acre-feet of ground water is pumped during June, July and August for rice irrigation. This large withdrawal of water over a period of years has resulted in a permanent decline of the water levels necessitating the lowering of the pumps near Roanoke from about 35 feet to 80 feet below the surface in the past 30 years. The seasonal character of the pumpage is responsible for the large fluctuation of the water levels during the year as shown in figure 6 which is a graph of the water levels of three wells equipped with water stage recorders. Two of the wells, JD-9, and JD-23, are located near the center of the heavy pumpage and show the sharp drop of the water levels during the summer and the subsequent slow recharge during the winter and spring. Well Al-1 is located outside of the area of heavy withdrawal of water, and is influenced only slightly by the pumping in the summer. Such graphs, when extended over a period of years, will indicate the general trend of the water levels and furnish data necessary for the determination of the safe yield of the aquifers.

Preliminary observations in this area were begun in June, 1938. Detailed field work was initiated in December, 1938 and has been in progress since then. Four water level recorders have given continuous records during this time and hundreds of individual measurements have been made. Present plans call for the assembling of sufficient data to permit the construction of three piezometric maps (similar to figure 2) during the year. One map will represent the water levels in the winter, one in the summer prior to the pumping season, and one in the fall immediately after the cessation of pumping. In order to make these piezometric maps, the water levels must be referred to a common datum which is usually mean sea level. This will require instrumental leveling from established bench marks to each of the wells. Some of this leveling has been accomplished, but more than half remains to be completed this winter. An accurate survey of the amount of water used in rice irrigation will be started next summer. The discharge of the individual wells will be gaged with current meters and estimates of total consumption made from pumping records of the well owners. The pumpage data and water level observations will be studied in the light of geological and hydrological conditions in the area and a report prepared next year.

AVOYELLES PARISH

Avoyelles Parish, located in the flood plain of the Mississippi River, is blanketed with sands, gravels, and clays deposited in Pleistocene and Recent time. These sediments range from 150 to over 300 feet in thickness and furnish large quantities of water. The water in the shallow sands is usually under water-table conditions and that from the basal sands and gravels is under artesian pressure sufficient to cause the water to rise in the well casings to within 30 feet of the surface. The principal ground-water supplies of the region are derived from the basal Pleistocene sands. Marksville, Mansura, and Cottonport have developed large supplies from this source.

A few deep wells penetrate Miocene sands which yield fresh soft water near Bunkie, Bordelonville, and Simmesport. At other localities impotable brackish water has been found not only in these deeper sands but also in the Pleistocene and Recent materials. Some of the water from the Miocene sands near Bunkie and Bordelonville contains injurious quantities of fluoride. The only town supply obtained from Miocene sands in Avoyelles Parish is that of the town of Bunkie which uses about 200,000 gallons a day.

Field work was extended into this Parish in 1938 in connection with the problem of occurrence of fluoride in harmful amounts in the water from deep wells in Bunkie and vicinity. The results of this local investigation were published by the Department of Conservation as Geological Pamphlet No. 1, in which the development of shallow water which contains no fluoride was recommended. In 1939 additional work, consisting principally of water sampling and the collection of geological data, was carried on in this Parish. More detailed ground-water work is scheduled for the near future.

TANGIPAHOA AND ST. TAMMANY PARISHES

Sands and gravels at depths of 50 to 2000 feet supply large quantities of soft water in these Parishes. Wells penetrating the deeper sands and gravels flow with pressures ranging from 5 to 40 pounds. Some of the shallower wells

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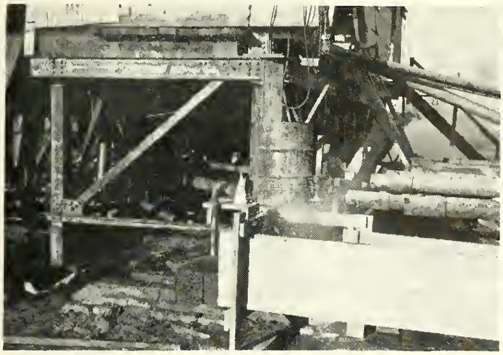
[9] Jenkins, M. J., Rice: Louisiana State Department of Agriculture and Immigration, pp. 7, 18, 1937.



■ **Typical set-up of a mud ditch and chemical treatment tank. The inverted white cone is a Marsh Viscosity Funnel used for determining the viscosity of the mud fluid.**

[*Photos by Metzger.*]

■ **Typical view of the slush or mud pit and mud pumps.**

Drilling Mud

By
Mark Seirsdale

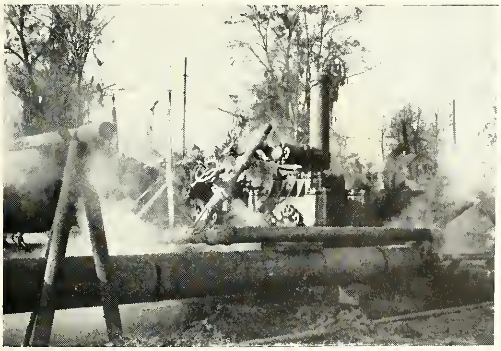
General Manager, Louisiana Boganite Corporation, Bogalusa, La.

When next you visit a drilling rig in operation, pay much attention to the unimportant appearing stream of muddy looking solution flowing from underneath the rig and thru the sluice way into a pit located beside the rig. This noxious looking solution is the all important "drilling mud".

Drilling mud is a mixture of water and an air floated powdery non-metallic mineral, which, by virtue of certain unique characteristics stay in suspension thru its trip from the pit into the pumps, down the drill stem to the bottom of the hole, (often over two miles deep), out thru the drill bit and up again between the drill stem and the well hole, into the sluice way whence it flows to the settling pit and slowly back into the original mud pit. During this round trip, the "mud" performs some of the most important functions connected with the drilling of an oil well.

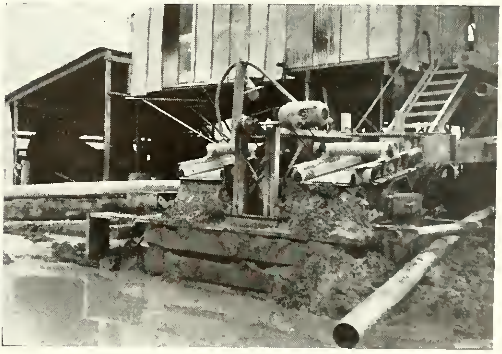
Editor's Note.—It is an interesting commentary on the changing facets of our economic life that the large deposit of Fuller's earth located near Hammond, La., should have been considered originally most useful as a raw material for Milady's cosmetics and that it now performs an even more ingenious service as the drilling mud in Louisiana's newest and most fascinating industry, the recovery of "black gold."

As a hole is drilled innumerable types of formations are encountered—sand, gravel, clay, shale, rock, etc. At various depths there may be pressure areas which could blow out the well, high temperatures and chemical elements which could thicken and change the composition of an inefficient mud so as to stick the drill or permit the mud to gas cut, granular formations which can cave in and fill the hole, porous formations thru which ineffective mud might seep by millions of gallons, shales, which when contacted with water may expand and continuously fill the hole or which water may cause to disintegrate and cave into the hole faster than it can be removed by the drilling equipment. Salt water, too, may tear the heart out of a well. All these complications are controlled by "drilling mud". In addition the mud must carry out cuttings made by the drill bit, from the bottom of the hole to



[*Photos by Metzger.*]

■ **Mud pumps in action.**



■ **Vibrating Screens used to separate the shale, cuttings and other foreign matter from the mud laden fluid.**

the settling pit, drop out the cuttings automatically and flow as a clean mud back into the pumping pit to start a new trip.

More and more the importance of scientific mud control is accepted as the solution to so many previously considered uncontrollable complications. Good mud adheres to the side wall of the hole to form a thin coating or side wall which is almost impervious to water penetration; the more impervious and thinner the coating or wall is, the better the mud. The mud must fill up the pore spaces in potentially caving formation and make the well wall rigid and firm. It must keep water from seeping behind the wall there to get into crevices in the shale and cause wedges to swell or to cave-in the shale by disintegration.

Good mud keeps back the pressure in the hole by adding weight to the water column. Water weighs approximately 8-1/3 lbs. per gallon which can be built up to 18 lbs. per gallon and more by the addition of the mud material. Obviously blowout hazards which may kill people, destroy the well and equipment and lose large quantities of our precious natural resources, is modified in proportion to the increase in the weight of the mud contained in the hole. The pressure exerted by the weight of the thousands of gallons of mud in the hole is kept a safe margin above the pressure from the bottom hole formation.

Good mud does not settle out. The permanently suspended powdered particles in the water, maintain an emulsion like mud solution which will not permit gas seepage nor lose its efficiency and wall building properties as a result of heat or other conditions encountered in the hole.

A mud which does not form a thin wall reduces oil production and increases drilling costs. A thin wall naturally disintegrates easily and permits easy passage of the oil from the formation into the hole. A thick wall will not disintegrate, and therefore impedes the passage of the oil; it sloughs off easily, exposing the formation to the damage of water contact and greatly handicaps the drilling.

One of the effective minerals used for drilling mud, is manufactured from an age old deposit near Bogalusa, Louisiana. It is made into a drilling mud material called "Spudmud" and "Boganite". Their raw material is Montmorillanitic and has the unusual characteristics necessary to make "Boganite" without treatment. When fabricated it makes the product "Spudmud".

"Boganite" yields 13 barrels of 11 lb. per gallon mud to a ton. "Spudmud" because of its peculiar swelling properties makes 50 barrels of 9 lb. per gallon mud per ton, at pumpable viscosity.

The "Boganite" material lies in veins under from three to four feet overburden. It is mined by striping with a dragline, loaded into dump trucks out of carefully tested areas and hauled to the "Boganite" plant. Here it is stored in bins and after seasoning is shovelled by hand to a 100 foot belt conveyor. This transports the wet raw material to an elevator where it is automatically lifted into an enormous rotary drier.

The preliminary drier is heated with about 3,000,000 B.T.U.'s per hour from natural gas. As the material travels thru this drier about one half of the water it contains is evaporated at the rate of about 1,000 pounds per hour. The semi-dried material leaves the drier and is lifted into a large crusher where the particle sizes are reduced to one inch and under. From here the material goes to a semi-finished bin where the "Spudmud" receives certain treatment, whence it travels into a hugh pulverizer which is operated electrically with 160 H. P.

In the pulverizer the material is completely dried and when it reaches the right particle size, 95% 200 mesh, floats into a finished product bin. From here the material is sacked in 100 lb. valve bags at the rate of up to 12 tons per hour and then stored or placed immediately in cars for shipment. In the meantime samples are taken from the front end and laboratory tested.

The tests consists of elutriation for sand contents, which in Boganite is kept below 1½% and in "Spudmud" less than ½ of 1%. For yield, with precision scales to weigh the material required to make a certain volume at a specific viscosity. A marsh funnel and a 1000cc graduate to test the viscosity. A mud weight hydrometer to test the weight per gallon. Boganite is maintained at between 10½ and 11 lbs. per gallon, "Spudmud" at 9 lbs. per gallon. The material is subjected to 100 lb. pressure for thirty minutes to test out its wall building capacity and sealing value. Water loss in "Spudmud" is maintained at less than 11cc, in "Boganite" at less than 20cc. The filter cake is maintained at less than 3/64" for "Spudmud" and 3/16" for "Boganite".

MOOSE BE WRONG!

Many Indian tribes believed the moose came from the sea . . . and some believed that if the animal were hunted too heavily, he would return to the ocean as a natural refuge . . . which is a perfectly natural belief . . . because, if moose were seen by unreasoning Indians swimming from some distant, unseen island land, it might well be thought to come from the open water.

The Louisiana Geological Survey

[Continued from Page 14.]

does the report contain descriptive accounts of the deposits but also mechanical and mineralogical analyses. A stratigraphic study of the deep gravels encountered in wells in the state will also be included.

Aside from the strictly geological, the Louisiana Geological Survey will shortly furnish another anthropological report. This report is an analysis of an Indian mound excavated near Catahoula Lake in La Salle Parish. The work for this report was financed jointly by the W. P. A., Louisiana State University, and the Louisiana Department of Conservation.

The geological bulletins published in 1939 are as follows:

Howe, H. V., Louisiana Cook Mountain Eocene Foraminifera: Louisiana Dept. Cons. Geol. Bull. 14, 122 pp., New Orleans, 1939.

This bulletin describes and pictures 170 species and varieties of foraminifera from 169 surface localities of the Claiborne group in Louisiana. A check list of species and localities is included.

Huner, J., Jr., Geology of Caldwell and Winn Parishes: Louisiana Dept. Cons. Geol. Bull. 15, 348 pp., New Orleans, 1939.

This bulletin gives a detailed account of the stratigraphy encountered in the area, especially of the Cook Mountain formation. Both lithologic and paleontologic members and zones are described, some for the first time. Other parts of the bulletin include discussions on physiography, salt domes, and economic geology.

Marsh, Ralph E., Reports on the surface water supply of Louisiana to September, 1938: Louisiana Dept. Cons. Geol. Bull. 16, 196 pp., New Orleans, 1939.

This bulletin furnishes statistical data on stream flow in Louisiana.

Maher, John C., Fluoride in the ground water of Avoyelles and Rapides Parishes, Louisiana: Louisiana Dept. Cons. Geol. Pamphlet No. 1, 23 pp., New Orleans, 1939.

This pamphlet contains numerous chemical analyses of well water from parishes mentioned in the title. A discussion of the acquifiers in the Miocene and younger sediments is also included.

WATER, WATER, ETC.

Birds and animals often starve to death in the midst of plenty . . . because they do not know that unfamiliar foods are good to eat . . . for instance, it took two or three years for quail in Florida and Georgia to find out that millet and other grains, planted for them, were good to eat.

Better Control in Louisiana

By
Neil Williams

Spreading development and increasing number of wells completed in coastal Louisiana fields, constantly augmented by the continued widespread drilling activity, are beginning to complicate control of production in Louisiana. Despite drastic reductions made in allowables of many existing fields and wells and adoption of more effective proration methods, state production is about back to the peak reached last July and steadily increasing. Now, being more limited in the extent to which further reductions in allowables can be ordered, the state may be faced with the necessity of permitting production to exceed market-demand estimates of the Bureau of Mines unless such estimates can be increased.

The Department of Conservation consistently has attempted to keep the state's production within the Bureau of Mines market-demand estimates. Fortunately, until now, existing allowables have been sufficiently high so new production could be absorbed. At the same time, by drastic reductions in allowables of a number of fields last August production was reduced so much below the Bureau of Mines estimates that, with further reductions in other fields since, there has been adequate margin to take care of new production.

DOWN TO MINIMUM

However, as a result of these reductions, it now is believed by conservation officials that production of most existing fields and wells has been curtailed about to a minimum consistent with good practice and policy, and additional new production will have to be taken care of by other means than by butting into the allowable of present fields and wells. This is in face of the fact that allowable production allocated to wells in some fields still is considerably more liberal than is customary in some other states. Most of the fields are in coastal Louisiana, where the difficult and costly conditions under which some of the fields are developed require higher allowables so long as efficient and conservative production practices are followed.

These allowables, on the other hand, now are greatly in contrast to the excessively high well allowables granted in some coastal Louisiana fields prior to last August when the more conservative policies were adopted by the Department of Conservation with the change in its administration made during the shakeup launched by Gov. Earl K. Long. Then it was not uncommon for wells to be permitted to produce as much as 500 bbl. and in some instances as much as 1,000 bbl. daily. Such high allowables have been entirely discontinued, which is in line with public declarations of both Governor Long and Ernest S. Clements, newly appointed conservation commissioner, that Louisiana from then on could be counted on to cooperate in every way possible with other states in efforts to prevent excessive production that might tend to disturb market conditions.

Current practice of the Conservation Department for allocation of allowables each month, taking into consideration new production brought in, has been to use the preceding month's allocations as a base, adding the new production brought in during the month by fields, and totaling this for the state, to determine the production in excess of the Bureau of Mines estimates. Production of all fields in the state then has been reduced each month the percentage necessary to bring the total allowable within the Bureau of Mines figures.

Editor's Note.—In its issue of November 30, 1939, The Oil & Gas Journal of Tulsa, Okla., largest publication of the petroleum industry and second largest trade publication in the world, published an extensive article by its district editor, Neil Williams. This article gives such a comprehensive and accurate picture of the oil situation in Louisiana that we believe our readers will find it of unusual interest and value.

Still desirous of continuing the state's production within the bureau's estimates, but hesitant about making further reductions in existing allowables to take care of new production, conservation officials are considering proposals to the Bureau of Mines for increases in its allocations to Louisiana. It is contended that in view of its steadily increasing reserves and production, the state is entitled to a much larger proportionate share of the country's market demand. It also is claimed there now is a demand for Louisiana crude greatly in excess of the present allowable.

NOVEMBER FIGURES

Basic allowable of Louisiana for November has been 258,994 bbl. New wells brought in since November 1 have boosted production above 268,000 bbl. This is 4,000 bbl. above the allowable for last July when a peak was reached in production. With the daily allowable for that month at 264,163 bbl., production went as high as 275,000 bbl. due to new production brought in and special authorizations for additional oil that might have been granted. Effective August 1, however, following accession of Governor Long, and his expressed desire to prevent overproduction, allowable production was cut 22,561 bbl. to 241,602 bbl., which was 17,378 bbl. under the Bureau of Mines estimates for Louisiana. A further small reduction was made for September, but since then the accumulating new production has been forcing increased total allowables to a level approximately equal to the Bureau of Mines estimates. To prevent allowable production for this month from exceeding the Bureau of Mines figures, allowable production of all fields and wells was reduced 8 per cent.

It has been possible for the Conservation Department to make a small reduction in the total daily allowable for December, which has been set in the proration order just issued at 255,200 bbl. By this cut, amounting to 3,794 bbl. from November schedule, production again is being held to the Bureau of Mines estimate of daily market demand for this state, despite the fact that the estimate for December, which is exactly the new allowable, is 3,800 bbl. less than for the past month. However, any additional wells completed and new production brought in during the month will force the allowable production to exceed the Bureau of Mines forecast of market demand.

DECEMBER ALLOWABLE

The December reduction in total daily allowable is being effected largely at the expense of North Louisiana fields, whose total allowable has been ordered cut 6,135 bbl. to 61,024 bbl. Daily allowable for coastal Louisiana is being increased 2,341 bbl. over the November schedule. Allowable reductions have been ordered in 46 coastal Louisiana fields; but, except at Jennings, where daily allowable is to be cut 1,508 bbl., and Lafitte, with a 1,466 bbl. cut, the revisions are small and are being more than offset by increases in other fields, chief of which are Charenton, Cheneyville, Golden Meadow, University and Ville Platte, where important new development is taking place. To add to the coastal Louisiana production at the start will be Shell Oil Co., Inc.'s new field at Happytown, St. Martin Parish, just opened and not included in the December proration order, and possibly two other fields now being opened, one by Pan American Production Corp. at La Pice, St. John the Baptist Parish, and the other by Tide Water Associated Oil Co. at Bay Brussell, La Fourche Parish.

The drastic reduction made in August was effected largely by cuts in the allowables of a relatively few fields, mostly in coastal Louisiana. As the allowables of these particular fields since have not been increased, it is significant that, with production about back to the peak, new production brought in since August has totaled at least the amount of the August cut. No increases in allowable have been made in any field except to take care of new developing production. At the same time, the new production is somewhat greater than that figure as additional reductions have had to be made in well allowables generally each month to keep the production total down.

Indicative of the development is the increase in producing wells. In coastal Louisiana, where the major development is taking place, there now are more than 1,620 producing wells, an increase of approximately 200 since July. Considering that in most fields, development is on a restricted basis, this increase is sizable for coastal Louisiana. Since the first of the year there has been an increase of more than 400 in producing wells.

Although operations in many districts have been at low ebb for several months, drilling in coastal Louisiana has continued active. There now are more than 160 drilling rigs running in the district. The number of active operations has been steadily increasing all year, the most active in the district's history. Except for 18 rigs at Golden Meadow, 10 each at University and Eola, 9 at Ville Platte, and 7 at New Iberia, there are no large concentrations of activity to run up the total number of rigs. This reflects the widespread nature of the play.

It so happens that there is no important leasing activity in the district at this time, in contrast to the active leasing play going on for several years. This inactivity, however, is attributed to the fact that most of the companies now are far ahead of themselves in leasing, and with numerous blocks already leased remaining to be drilled they are trying to catch up before taking on anything more. The Mississippi play also has turned their attention away so far as leasing is concerned.

Out of the drilling activity, at least 12 new fields have been opened in coastal Louisiana this year, one of the most successful wildcatting years in the district's history. These do not include a number of fields, proved previously by gas wells, but in which first oil production was not opened this year. Among discoveries this year are a number regarded as of more than ordinary importance.

THREE NEW FIELDS OPENED

Three new fields have been opened within the last 2 months, one of these in the past week, while two additional fields, previously mentioned, are in process of being opened.

Keeping pace with this development, the Conservation Department, under the present administration, steadily is providing more efficient and effective regulation over drilling and production. Control of production is being placed on a more scientific and engineering basis with administration being extended to take in not only allocation of allowables to the respective fields but to the different leases and the individual wells.

Attention particularly is being directed to the producing conditions of the individual wells whose allowables are now being restricted to production consistent with efficient engineering practice. Under the program being developed, stricter regulation of drilling permits is being observed that more orderly drilling and spacing programs might be affected. Although not attempting to interfere in existing fields, except in prevention of waste or excessive production, the Department of Conservation is undertaking to conduct public hearings for all new fields to determine the most adaptable practices. Such hearings have been held for Golden Meadow and Eola and have been called for two more recently opened fields: Barataria, Jefferson Parish, and La Fourche Crossing, La Fourche Parish.

In the carrying out of its new program, the Conservation Department has received close cooperation of the majority of operators, despite the fact that the program has called for stricter control of production and operations. Two court attacks have been made recently on local proration allocations, but conservation officials have been attempting to work these out equitably. In one attack, George Lilly, of Houston, contested a reduction of allowable ordered on a well unit in the Eola field, and in the other, Glassell & Glassell, Inc., are seeking an increased allocation at Jennings, contending they are not receiving their proportionate share of the allowable granted the Jennings field. In the former case, already heard in court, it was claimed that in a reduction of allowable of the well involved from 60 to 30 bbl. daily, the Conservation Department had acted arbitrarily, resulting in discrimination, in view of the fact that neighboring wells, some on smaller tracts, had been granted higher allowables. The lower allowable was ordered, the Conservation Department claimed, because of alleged excessive gas-oil ratio. The case was settled by the court ordering restoration of the 60-bbl. allowable pending a field hearing at which the relative status of the well with other wells in the field could be determined.

In the Jennings case, the plaintiffs are not attacking the field allowable, but claim that in the allocation to operators and wells they are permitted to produce only 25.86 per cent of the allowable granted the area in which their wells are located while they own 40.23 per cent of the productive area. With a view to adjusting any possible inequities, the Conservation Department, in line with its new practices for South Louisiana, conducted a public hearing at Lake Charles the past week, and from the evidence presented a new order will be issued for the field if considered justified.

With Louisiana now in the midst of a spirited political campaign preceding the state elections in January, there has been some speculation as to what effect the outcome of the election will have on Louisiana's proration program, especially in view of the scandals unearthed. Governor Long is one of the five candidates for governor. So far, the oil industry outwardly has taken no part in the campaign and as yet the Department of Conservation or its regulation of the oil operations has not been involved in any way in the campaign.

* * *

COLD AND SLOW

Repeated experiments have proven that the temperature of a hibernating animal is usually about five degrees lower than the surrounding air . . . so, if the air were so cold that the animal's body temperature went below the freezing point, it would freeze to death . . . which is probably the reason most animals "dig in" for the hibernating period . . . Incidentally, heart action is almost suspended during complete hibernation . . . for instance, the heart beat of an active ground squirrel is normally around 350 a minute . . . yet the heart of the same animal slows down to about seventeen beats a minute—or about every sixteen seconds—during hibernation.

Where to Fish in Louisiana

For Largemouth Black Bass

By

Percy Viosca, Jr.

■ "Big bass lurk under lily pads"—Tchefuncte River, near Covington, La.

At home alike in running streams of the uplands, in lakes and sluggish bayous of the large river valleys, and in brackish lagoons near the coast, is the largemouth black bass, better known to many anglers as the "green trout." There can be no question but that this species is the most sought after sport fish in Louisiana waters as well as throughout the greater part of its range in this country, viz., the vast area east of the Rocky Mountains. It is doubted if any other fresh water fish can exist and thrive under a greater variety of natural conditions. The species is found even in the muddy Mississippi, for any high water leaves them isolated, often by hundreds, in every pit or pond on the batture.

Although found in all rivers, lakes, ponds, lagoons, and bayous in the state from the Arkansas line down to the very edge of salt water, the largemouth bass shows a decided preference for still or sluggish water. In swift water, it is usually replaced by the southern smallmouth bass or spotted bass. This does not mean, however, that the largemouth species is not frequently taken in such streams. Evidently it does not breed in the swifter type of stream unless there are ample areas of still water such as is provided by oxbow or cut off lakes.

Nevertheless great catches of the species are sometimes made in swift water. The most notable instances of this occur after recession of great floods on the large rivers. During such floods, abundant food for the largemouth bass becomes accessible in the backwater areas, and not only is an excellent crop of young bass produced, but there is an almost mushroom-like growth of this crop, as well as of specimens from the year before. When the water recedes, these fish are crowded back in the rivers and lakes where they soon experience a food shortage.

Such a situation can be remedied only by a movement or migration. Whenever the individuals in such a crowded population find the mouth of a swift creek, they range into it to forage. Here for a time they find a wealth of new food, but only too soon this is gone and they are hungry again.

By this time Mr. Louisiana Angler gets a report that bass are biting down near the mouth of the creek and soon both banks are lined with fishermen. Live bait is at a premium and bait wagons bring it in from 50 or 100 miles away. Under such conditions, any kind of artificial lure will bring results and there is a sell out of stuff that has lain on the shelf for years. Gradually, however, when things return to normal in these streams, we find the smallmouth to be the dominant species there.

The breeding season of the largemouth bass in Louisiana is usually during March and April. The fish here spawn largely on firm mud bottoms, often amongst submerged vegetation, and usually in water from 1½ to 3 ft. in depth. An area about 2½ ft. in diameter is swept clean by the fins of the male. After the eggs are deposited they are kept clean and aerated in the same manner until they hatch. The hatching period usually requires 5 to 15 days, depending upon the temperature. The male guards the fry for about 10 days—until the schools break up, and the young bass seek food and refuge amongst aquatic vegetation.

In Louisiana, the largemouth bass seldom attains a weight of 7 lbs., most prize fish being under that weight. The rate of growth depends upon the density of the bass population in proportion to their food supply. Under the conditions that usually exist in nature, it may take as much as 10 years for a specimen to attain a weight of four pounds, yet there is the definite record from one of the new borrow pits in the Bonnet Carre Spillway of one which attained a length of 19¼ in. and a weight of 4 lbs., 12 oz. at the end of its third summer of life, or an average accretion in weight of nearly 2½ oz. per month.

The largemouth bass is a voracious feeder, taking almost any living creatures that it can swallow. Insects of many kinds, crawfish, lizards, snakes and frogs are a few of the items found in their stomachs, in addition to a large variety of fish including their own kind. They will strike almost any kind of artificial lure upon occasion and more different kinds have been designed and used for taking this species than for any other kind of game fish. The largemouth bass can be taken by fly or bait casting, by trolling, and by still fishing. Live minnows, shrimp, soft-shelled crawfish, frogs and insects are the best natural baits.

Although not usually a schooling species and each individual frequently has a home stump, log, or lily pad, there are conditions under which schooling does occur. One of these, the crowding into swift streams after an overflow, has already been described. Frequently large numbers will crowd certain spots such as the fork of a stream, or the shoal, where a small tributary enters a larger stream or lake. The greatest schooling of the species occurs in tide water areas, however, and is most noticeable in fish in their first year of life. It occurs most frequently after any unusual rise of the water and subsequent recession, or after a heavy rain. The young bass will then gather in great numbers to feed at the mouths of small tidal creeks, catching the helpless minnows and other feed driven out by the rapidly falling water.

Although the largemouth black bass ranks as one of the finer food fishes of the country, it is exceeded in flavor and texture by a number of species. Specimens taken in "clear water" lakes and in moving brackish water usually have a better flavor and quality than those taken in "green water" lakes or stagnant ponds. From any particular area, fish taken during the cold months are better than those taken during warm weather. The flavors they develop in warm water or stagnant places seem to be derived in some way from the vegetation of those areas. If, however, the fish is cleansed and bled before rigor-mortis sets in, and the bloody tissue attached to the backbone removed, little or none of the objectionable flavor will remain. It is always best to chill or freeze it immediately after cleansing, preferably while the tissue is still alive.

* * *

COLD SPELL GIVES HOPE FOR CONTROL OF WATER HYACINTH

Hope for control of the water hyacinth, a beautiful plant but long a scourge of Louisiana waterways, was expressed by Biologist John J. Lynch of the U. S. Biological Survey on a recent visit to the Department of Conservation following field work in coastal marshes. Lynch based his hopes on results of the January cold spell in this region, which though an ill wind he thought had done some good by killing water hyacinth growths.

Water hyacinth, he pointed out, is a tropical plant and has been seriously retarded in this State either by cold weather or by salt tides in coastal waterways. New plants, however, may be expected to grow from seeds for at least the next two years, and permanent benefits of the recent destruction will require a constant killing off of these seedlings before they have a chance to spread.

Such control, said Lynch, will require the cooperation of everyone in water-hyacinth areas. Superintendents of hunting and trapping clubs, oil operators, fishermen, trappers, Boy Scouts, and everyone who has occasion to be in the marshes and swamps should make themselves familiar with the water hyacinth and lose no opportunity to destroy it. Small growths may be destroyed by throwing the plants out on the banks to dry. Larger growths may be killed by a sodium arsenate spray, the formula for which may be obtained from the First New Orleans District Office, Corps of Engineers.

Progress of Ground Water Investigations in Louisiana

[Continued from Page 38]

also flow, but only in the southern portion of the area near Lake Pontchatrain. The pressures on these wells range from a fraction of a pound to about 5 pounds. These shallow flowing wells have made possible the extensive truck gardening by means of irrigation in the area south of Hammond known as the "Strawberry Belt". Some of the water in Tangipahoa and St. Tammany Parishes contains fluoride in quantities slightly exceeding the limit set by the U. S. Public Health Service.

Observation wells have been established throughout the Parishes, and records will be kept from year to year. Analyses of the water samples are on file in the offices of the Ground Water Division at Louisiana State University. A detailed report on the water resources of Tangipahoa and St. Tammany Parishes is to be prepared in the course of the work.

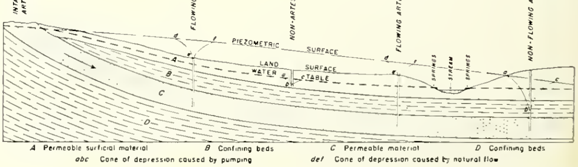
EAST BATON ROUGE PARISH

Perhaps the most concentrated withdrawal of ground water in the State is that in East Baton Rouge Parish, where large supplies of fresh water have been developed from sands lying from 300 to 2000 feet below the surface. It has been estimated that more than 50 million gallons of ground water is used each day for cooling purposes in the highly industrialized area north of Baton Rouge. The withdrawal of large quantities of water from the "700-foot" sand in this area has resulted in the decline of the static water level of that sand from 44 feet below the surface, as reported in 1914, to 170 feet below at the present time. The static water levels of the deeper sands, penetrated at depths of 1600 to 2000 feet, have not been lowered seriously as only a small number of wells have been drilled to this depth. The water in these deeper sands is under sufficient artesian pressure to flow at the surface with considerable head, but it is too warm (86°-92°F) to be suitable for cooling purposes. The water in these sands is brackish near the University campus, south of Baton Rouge. The question of the disposal of the oil-well brines of the University oil field into these brackish water sands has recently been considered. In as much as the City of Baton Rouge is supplied with fresh water from these sands to the north, a detailed study of the water sands, the relative artesian pressures, and the chemical character of the water should be made before such disposal is permitted.

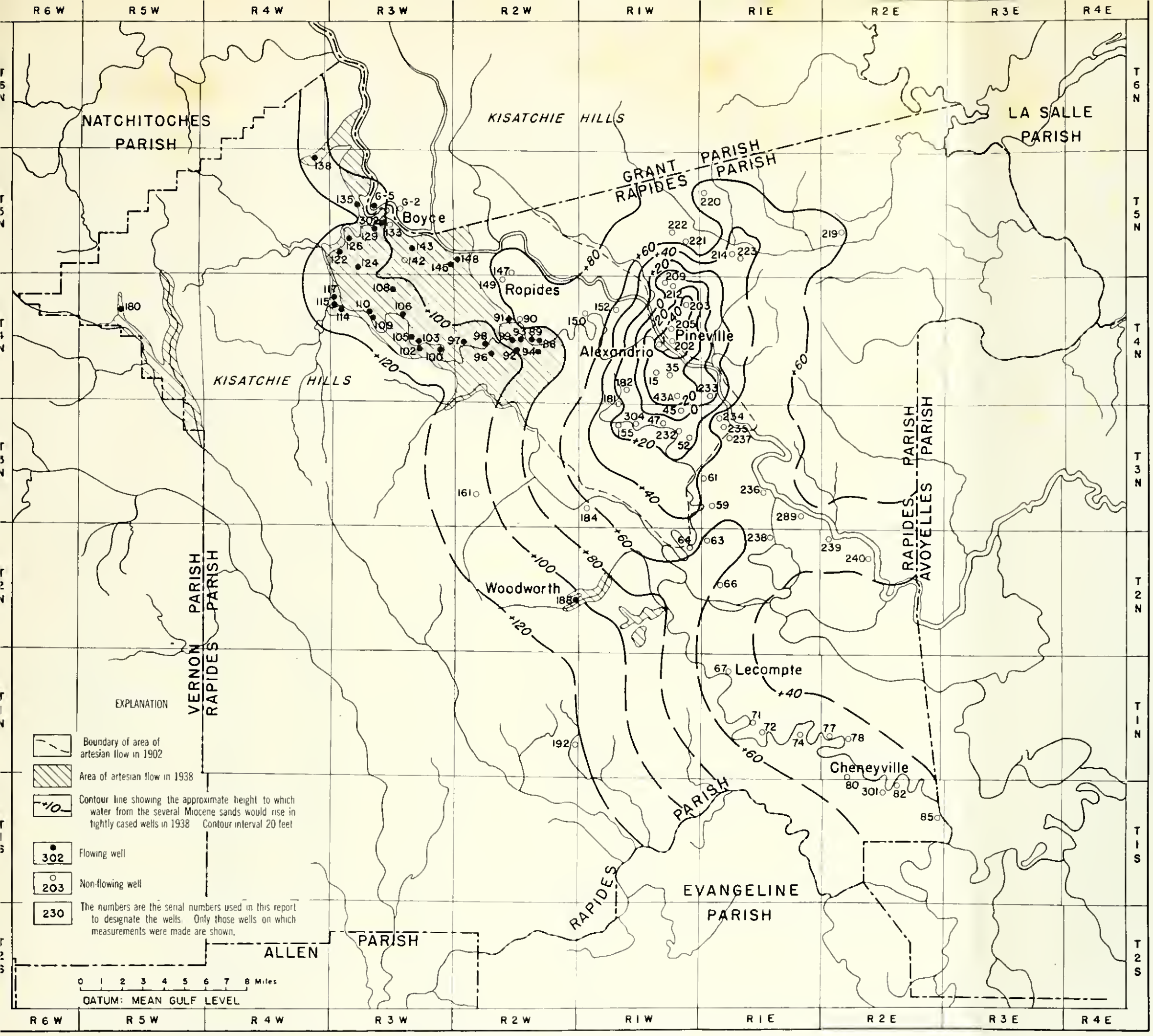
Preliminary investigations have revealed the need for both a systematic areal survey of the whole Parish and a special investigation of the potential water supplies of Baton Rouge and the industrial area to the north. In the areal survey, the general occurrence and chemical character of the ground water including the delineation of the southward extent of the fresh water in each of the several water sands, will be considered. The special investigation will include the installation of water level recorders, the compilation of pumpage records, and, if possible, specific tests to determine the safe yield of the aquifers.

SUMMARY

Detailed ground-water investigations have been made in Rapides, Grant, La Salle, Jefferson Davis, and Acadia Parishes. Preliminary investigations are in progress in Avoyelles, Tangipahoa, St. Tammany, and East Baton Rouge Parishes. The results of qualitative investigations of the ground water of Avoyelles and Rapides Parishes were published in June, 1939. A detailed report on the areal survey of Rapides Parish, Geological Bulletin No. 17 of the Louisiana Department of Conservation, is now in press. An areal survey of the ground water resources of Grant and La Salle Parishes was completed this fall, and the preparation of a report begun. Field work in the rice irrigation area will continue until next winter, at which time sufficient data will be at hand for a quantitative



■ **Figure 2.—Diagram illustrating artesian and non-artesian conditions.**



MAP OF RAPIDES PARISH SHOWING PIEZOMETRIC SURFACE OF WATER IN MIOCENE SANDS

■ **Figure 3.—Map showing piezometric surface of water in Miocene sands in Rapides Parish.**

report. All observations of water levels in key wells in the State is published each year in the Louisiana Section of "Water levels and artesian pressure in observation wells in the United States", an annual publication of the Federal Geological Survey. Measurements made in 1938 are included in Water-Supply Paper 845.

* * *

WILDLIFE WEEK

The third annual National Wildlife Week begins March 17, 1940. Sponsored by the National Wildlife Federation, and endorsed by Presidential proclamation, Wildlife Week reminds the nation that co-ordinated effort is necessary to protect what is left of outdoor resources, and to restore what can be brought back. Its aim is education in the fundamentals of conservation.

The National Wildlife Federation had its origin at the first North American Wildlife Conference, called in Washington by the president in 1936. It is not "another organization," but an alliance through which all organizations concerned with the future of wildlife and our natural resources can function.

Wildlife Week was proposed at the second North American Wildlife Conference in St. Louis in 1937. It was participated in by widely diversified groups in various states—the Izaak Walton League and other sportsmen's organizations; garden clubs and 4-H clubs; Audubon Societies and state conservation departments; schools, churches; civic and business clubs; The American Legion and Boy Scouts, Girl Scouts, Campfire Girls—a large section of 36,000 local organizations interested in conservation.

This is the third year for the celebration of National Wildlife Restoration Week. As in 1938 and 1939 the distribution of Wildlife Poster Stamps will be carried on by the National Wildlife Federation and its state, county and local affiliates.

The first outstanding achievement of the National Federation is the Pittman-Robertson Federal-Aid-to-Wildlife Act, turning back to the states, for wildlife restoration projects, all federal excise tax funds on the sale of sporting arms and ammunition which will amount to $3,500,000 by June 30, 1940. A majority of states have already set up their projects, and others are being prepared for approval by the Bureau of Biological Survey.

Oil and Gas Wells Completed in South Louisiana During 4th Quarter of 1939

Field	Name of Company	Name of Well	Date Completed	Daily Initial Production	Size Choke (Inch)	Grav-ity	Total Depth
BANCROFT (Beauregard Pr.)	Republic Prod. Co.	Columbia L&T Co. #11	10/6/39	289.00	3/16	41.8	7,321
	Republic Prod. Co.	G. T. Whitman #1	10/30/39	295.00	3/16	42.7	7,337
	Republic Prod. Co.	G. T. Whitman B-1	11/15/39	352.00	3/16	43.1	7,332
	Republic Prod. Co.	J. A. Whitman, Jr. #1	11/24/39	270.48	12/64	43.5	7,321
	Republic Prod. Co.	Columbia L&T Co. #12	12/4/39	289.00	3/16	43.6	7,323
	Republic Prod. Co.	Clyde Franks #1	12/8/39	262.00	3/16	42.9	7,327
	Republic Prod. Co.	Columbia L&T Co. #13	12/21/39	273.00	3/16	43.2	7,330
	Republic Prod. Co.	Nettie Smith #2	12/23/39	221.00	3/16	43.1	7,319
BARATARIA (Jefferson Pr.)	The California Co.	Discovery well Adams-Ruttley #1	11/2/39	936.00	1/4	37.5	12,222
BAYOU CHOCTAW (Iberville Pr.)	Standard Oil Co. of La.	Wilbert Myrtle Grove #11	10/15/39	275.00	20/64	29.0	4,834
BAYOU DES ALLEMANDS (Lafourche Pr.)	Amerada Petro. Corp.	C. E. Gheens #3	12/28/39	130.00	10/64	32.4	7,563
BAY ST. ELAINE (Terrebonne Pr.)	The Texas Co.	State Bay St. Elaine #19	10/26/39	89.40	1/8	21.8	9,200
CAILLOU ISLAND (Terrebonne Pr.)	The Texas Co.	State Caillou Is. #61	10/28/39	453.00	1/4	34.1	4,375
CHALKLEY (Cameron Pr.)	Shell Oil Co., Inc.	K. B. Hanszen #4	11/20/39	567.96	1/4	37.6	8,990
	Humble Oil & Rfg. Co.	K. B. Hanszen #5	12/11/39	405.72	3/16	36.9	8,651
	Shell Oil Co., Inc.	K. B. Hanszen #5	12/22/39	957.48	1/4	37.2	8,962
CHARENTON (St. Mary Pr.)	Techeland Oil Co.	Paul LeBlanc #6	10/1/39	49.66	Open	20.4	1,798
	H. J. DeArman et al	Mrs. D. Boudreaux #3	10/1/39	291.60	Open	20.2	1,126
	H. J. DeArman et al	Mrs. D. Boudreaux #4	10/3/39	281.52	Open	21.0	1,126
	H. J. DeArman et al	Mrs. Neily Landry #2	10/4/39	190.32	1/4	21.8	2,466
	H. J. DeArman et al	Mrs. O. J. Simoneaux #2	10/6/39	372.60	Open	20.0	1,209
	H. J. DeArman et al	Mrs. O. J. Simoneaux #3	10/9/39	364.50	Open	20.3	1,205
	St. Mary Oil Co.	Achee #5	10/12/39	66.29	Open	20.2	1,126
	H. J. DeArman et al	Mrs. O. J. Simoneaux #6	10/19/39	513.36	Open	20.3	1,160.51
	H. J. DeArman et al	Mrs. O. J. Simoneaux #4	10/23/39	534.60	Open	20.2	1,232
	H. J. DeArman et al	Boudreaux #6	10/24/39	518.40	Open	20.2	1,161
	Techeland Oil Corp.	Paul LeBlanc #7	10/27/39	8.28	Open	20.4	1,800
	H. J. DeArman et al	Mrs. D. Boudreaux #7	10/27/39	210.60	Open	20.3	1,160
	H. J. DeArman et al	Mrs. Neily Landry #1	10/29/39	422.28	Open	20.3	1,210—50
	H. J. DeArman et al	Mrs. Neily Landry #7	11/2/39	388.80	Open	20.3	1,159
	H. J. DeArman et al	Mrs. Neily Landry # 3	11/2/39	226.80	Open	20.2	1,207
	H. J. DeArman et al	Alleman #7	11/4/39	291.60	Open	20.3	1,162
	Techeland Oil Corp.	Paul LeBlanc #9	11/4/39	82.80	Open	20.2	1,133
	H. J. DeArman et al	Mrs. Neily Landry #4	11/7/39	194.40	Open	20.2	1,123
	H. J. DeArman et al	D. Alleman #6	11/7/39	194.40	Open	20.3	1,160
	H. J. DeArman et al	Mrs. Neily Landry #8	11/9/39	405.00	Open	20.3	1,160
	Pan American Prod. Co.	A. Veeder & Co. #15	11/12/39	844.45	Gas Lift	20.0	1.334
	H. J. DeArman et al	Kern #6	11/12/39	388.80	Open	20.4	1,162
	H. J. DeArman et al	Mrs. Neily Landry #5	11/13/39	129.60	Open	20.2	1,142
	Fifteen Oil Co.	Thos. Brulatour, Jr. #2	11/13/39	145.04	Open	19.2	1,169
	Pan American Prod. Co.	H. Ecuer A-3	11/14/39	82.80	Gas Lift	24.0	2,462
	Pan American Prod. Co.	E. J. Robicheaux #11	11/15/39	459.96	Gas Lift	20.1	1,211
	St. Mary Oil Co., Inc.	Achee #6	11/19/39	364.32	Open	20.2	1,132
	H. J. DeArman et al	Mrs. Sidney Kern #7	11/19/39	41.40	Open	20.2	1,168
	Pan American Prod. Co.	W. J. Robicheaux #10	11/22/39	140.76	Gas Lift	20.0	1,158
	Pan American Prod. Co.	E. J. Robicheaux #12	11/24/39	182.16	Gas Lift	20.0	1,123
	H. J. DeArman et al	Mrs. Sidney Kern #5	11/25/39	469.80	Open	20.1	1,135
	H. J. DeArman et al	Mrs. Sidney Kern #8	11/26/39	486.90	Open	20.2	1,166
	H. J. DeArman et al	Simoneaux #7	11/27/39	372.60	Open	20.2	1,159
	H. J. DeArman et al	Alleman #8	11/30/39	405.00	Open	20.2	1,160
	H. J. DeArman et al	D. Alleman #5	11/30/39	226.80	Open	20.1	1,120
	H. J. DeArman et al	Simoneaux #8	11/30/39	64.80	Open	20.2	1,161
	Pan American Prod. Co.	South Coast Corp. #6	12/1/39	827.40	20/64	34.0	7,189
	Pan American Prod. Co.	E. J. Robicheaux #13	12/3/39	140.76	Gas Lift	19.9	1,125
	H. J. DeArman et al	Boudreaux #8	12/4/39	324.00	Open	20.2	1,166
	H. J. DeArman et al	Alleman #9	12/6/39	486.00	Open	20.2	1,167
	Pan American Prod. Co.	E. J. Robicheaux #14	12/10/39	49.68	Pumping	19.9	1,146
	W. Brown	D. Parro #1	12/11/39	149.04	1/4	37.2	6,708
	H. J. DeArman et al	Boudreaux #9	12/11/39	64.80	Open	20.2	1,168
	Pan American Prod. Co.	E. J. Robicheaux #9	12/15/39	97.32	Gas Lift	19.4	1,159
	Pan American Prod. Co.	Laws Realty #20	12/15/39	397.44	Gas Lift	19.7	1,166
	Pan American Prod. Co.	Laws Realty #21	12/20/39	496.80	Gas Lift	19.7	1,172
CHENEYVILLE (Rapides Pr.)	Gulf Refg. Co.	C. J. Pope "A" #1	10/7/39	389.52	1/4	36.3	5,745
	Amerada Petroleum Corp.	Weil #6	10/12/39	294.00	3/16	39.4	5,842
	S. W. Richardson	Weil #4	10/22/39	308.40	3/16	36.6	5,796
	Gulf Refg. Co.	Myrtle Pope #2	10/31/39	503.16	1/4	35.6	5,721
	Sid W. Richardson	Weil Co. Inc. #5	11/10/39	299.00	3/16	37.0	5,899
	Amerada Petro. Corp.	Weil Co. #7	11/20/39	261.00	3/16	41.6	5,815
	S. W. Richardson	Weil #6	11/28/39	363.50	3/16	36.6	5,800
	Sid W. Richardson	Weil Co. Inc. #7	12/15/39	292.00	3/16	36.6	5,800
CREOLE (Cameron Pr.)	The Superior Oil Co.	Gulf of Mex-State #8	10/3/39	202.44	10/64	33.9	7,051
	The Superior Oil Co.	Gulf of Mex-State #9	12/10/39	45.00	1/8	36.5	6,950
DARROW (Ascension Pr.)	Humble Oil & Refg. Co.	Humble Community #25	11/2/39	454.44	1/4	29.6	4,770
	Humble Oil & Refg. Co.	Humble Community #26	11/13/39	195.00	11/64	25.9	4,795
	Humble Oil & Refg. Co.	Community #27	11/24/39	130.00	1/8	30.5	4,745
DOG LAKE (Terrebonne Pr.)	The Texas Co.	State Dog Lake #23	11/27/39	323.68	3/16	38.1	7,049
EAST HACKBERRY (Cameron Pr.)	The Union Sulphur Co.	Simon Doiron #1	11/21/39	738.00	3/16	29.6	7,294
EDGERLY (Calcasieu Pr.)	Emerson Oil Corp.	Hunter #14	10/20/39	118.00	Pumping	25.2	3,504

Oil and Gas Wells Completed in South Louisiana During 4th Quarter of 1939

Field	Name of Company	Name of Well	Date Completed	Daily Initial Production	Size Choke (Inch)	Gravity	Total Depth
ENGLISH BAYOU (Calcasieu Pr.)	Union Sulphur Co.	O. H. Castle #10	12/10/39	342.96	1/4	39.4	6,993
EOLA (Avoyelles Pr.)	Sun Oil Co.	E. A. Townsend #1	5/20/39	601.46	14/64	43.0	8,568
	S. W. Richardson	S. S. Pearce #1	6/30/39	762.84	1/4	43.0	8,541
	Amerada Petro. Corp.	Robert R. Irion #1	7/13/39	658.29	3/16	43.0	8,689
	Amerada Petro. Corp.	Avoyelles Bk. & Tr. Co. #1	7/17/39	408.00	3/16	43.0	8,585
	W. C. Feazel	Keller Community #1	7/18/39	647.76	1/4	42.7	8,560
	Pomo Petro. Co.	Sentell #2	7/22/39	780.00	1/4	43.0	8,573
	Geo. E. Lilly	Haas Inv. #1	8/5/39	470.64	1/4	49.5	8,567
	S. W. Richardson	State Bayou Bouef #2	8/11/39	754.08	1/4	43.0	8,567
	Amerada Petro. Corp.	R. L. Whitlow #1	8/14/39	762.84	1/4	42.3	8,498
	S. W. Richardson	Est. Sam Haas #1	8/14/39	275.88	10/64	42.4	8,813
	Amerada Petro. Corp.	Glaze et al #1	8/24/39	360.00	3/16	43.4	8,520
	Amerada Petro. Corp.	Mrs. C. B. Marchive #2	8/27/39	358.60	3/16	42.3	8,528
	Amerada Petro. Corp.	Glaze et al #2	10/2/39	755.04	1/4	42.3	8,559
	Sid W. Richardson	Haas Inv. Co. #6	10/10/39	363.40	3/16	43.0	8,579
	Amerada Petro. Corp.	Marchive #5	10/11/39	747.00	1/4	42.3	8,530
	Sid W. Richardson	State Bayou Boeuf #3	10/17/39	407.00	3/16	43.0	8,575
	Geo. E. Lilly	L. B. Dent #1	10/18/39	390.00	1/4	43.0	8,576
	Amerada Petro. Corp.	Marchive #6	10/18/39	715.00	1/4	42.3	8,556
	Amerada Petro. Corp.	Heirs Pat. Glaze #3	10/24/39	780.00	1/4	43.0	8,556
	Amerada Petro. Corp.	C. B. Marchive #8	10/29/39	576.00	1/4	43.0	8,580
	Amerada Petro. Corp.	Heirs of Pat. Glaze et al #4	11/8/39	747.00	1/4	43.0	8,563
	Amerada Petro. Corp.	White et al Unit #1	11/14/39	325.00	3/16	43.0	8,558
	Amerada Petro. Corp.	Mrs. C. B. Marchive #7	11/22/39	732.00	1/4	43.0	8,559
	Sid. W. Richardson	Haas. Inv. Co. #7	11/23/39	314.70	3/16	43.1	8,600
	Amerada Petro. Corp.	Avoyelles B&T Co. #2	11/30/39	690.00	1/4	43.0	8,580
	Amerada Petro. Corp.	Glaze #5	12/9/39	780.00	1/4	43.1	8,575
	W. C. Feazel	P. Q. Sclater Comm. #1	12/9/39	754.00	1/4	40.6	8,570
	Sun Oil Co.	E. A. Townsend #2	12/10/39	519.00	1/4	43.0	8,572
	G. B. Kennedy	R. R. Irion #1	12/11/39	757.44	1/4	44.0	8,580
	Amerada Petro. Corp.	L. B. Dent #1	12/15/39	624.84	1/4	44.1	8,570
	Amerada Petro. Corp.	C. B. Marchive #9	12/20/39	650.00	1/4	43.0	8,570
	S. W. Richardson	Haas Inv. Co. #9	12/27/39	687.72	1/4	43.0	8,596
FAUSSE POINTE (Iberia Pr.)	The Texas Co.	St. Lake Fausse Pt. #6	12/4/39	64.80	1"	34.4	5,415
GARDEN ISLAND BAY (Plaquemines Pr.)	The Texas Co.	State Garden Is. Bay #37	11/4/39	267.00	1/4	35.0	5,795
	The Texas Co.	State Garden Is. Bay #38	12/15/39	259.00	3/16	32.0	5,440
	The Texas Co.	Garden Is. Bay #39	12/29/39	345.84	3/16	32.7	6,957
GOLDEN MEADOW (Lafourche Pr.)	St. Mary Oil Co.	M. Chouest #2	10/1/39	92.00	1/2	37.4	5,282
	Shields et al (Golden Meadow Oil Co.)	Collins Tract #1	10/7/39	225.00	16/64	38.0	5,487
	Berkshire Oil Co.	Joe Nicol et al #4	10/16/39	400.00	16/64	36.1	5,440
	The Texas Co.	Falgout #2	10/18/39	455.00	12/64	38.1	7,952
	The Texas Co.	LLE Golden Meadow #5	10/19/39	577.00	12/64	37.8	7,949
	St. Mary Oil Co. Inc.	Unit #6-#7	10/21/39	233.00	12/64	37.0	5,571
	The Texas Co.	Theriot #1	10/25/39	125.00	16/64	40.9	10,100
	Berkshire Oil Co.	Joe Nicol et al #7	11/2/39	260.00	16/64	28.0	2,670
	St. Mary Oil Co.	E. Williams #1	11/4/39	299.00	12/64	36.0	5,488
	Berkshire Oil Co.	Joe Nicol et al #6	11/4/39	350.00	16/64	36.0	5,230
	The Texas Co.	Falgout Hdlg. Co. #5	11/10/39	116.00	16/64	26.0	2,700
	Berkshire Oil Co.	Joe Nicol et al #9	11/15/39	250.00	16/64	26.0	2,660
	The Texas Co.	State Catfish Lake #1	11/18/39	150.00	Pumping	26.0	10,281
	C. W. Bowler & Paul F. Rutledege	Cheramie #1	11/20/39	72.00	7/64	35.8	5,502
	S. Rhodes	Falgout Hdlg. Co. #1	11/23/39	192.00	8/64	36.0	5,490
	Marr & Vaughn	Adam Terrebonne #2	11/27/39	300.00	12/64	38.0	8,945
	Taylor Fithian	Jos Orgeron #1	11/28/39	100.00	8/64	26.0	2,691
	Berkshire Oil Co.	Joe Nicol et al #10	11/30/39	250.00	1/4	26.0	2,660
	Jim McMurray Prod. Co.	P. Collins #1	12/10/39	140.00	10/64	36.0	5,210
	The Texas Co.	State Catfish Lake #5	12/10/39	125.00	Pumping	29.5	3,465
	The Texas Co.	LL&E Golden Meadow #4	12/13/39	185.00	3/16	36.0	5,190
	Peter Cioban	Natalius Alario #1	12/13/39	50.00	Pumping	26.0	2,669
	The Texas Co.	LL&E #6	12/16/39	200.00	12/64	36.0	5,436
	Berkshire Oil Co.	Joe Nicol et al #8	12/18/39	320.00	11/64	36.0	5,210
	Berkshire Oil Co.	Joe Nicol et al #13	12/18/39	250.00	16/64	26.0	2,683
	Golden Meadow Oil Co.	Whitney Rebstock #1	12/19/39	200.00	Pumping	26.0	2,700
	The Texas Co.	Falgout Hldg. Co. #4	12/22/39	357.00	12/64	39.5	7,935
	The Texas Co.	Falgout Hldg. Co. #6	12/23/39	166.00	3/16	37.3	5,170
	S. Rhodes	Falgout Hldg. Co. #2	12/23/39	166.00	1/8	36.0	5,216
	The Texas Co.	LL&E #7	12/28/39	238.00	12/64	38.1	7,946
	Berkshire Oil Co.	Joe Nicol et al #12	12/29/39	250.00	16/64	26.0	2,680
GRAND LAKE (Cameron Pr.)	Amerada Petro. Corp.	State Mallard Bay #1	10/11/39	462.60	3/16	33.9	8,579
	The Superior Oil Co.	State Grand Lake #4	11/20/39	260.00	10/64	33.5	8,374
	Amerada Petro. Corp.	Mallard Bay State #2	12/12/39	(Gas) 789,635 CFD	3/16	....	8,310
	Superior Oil Co.	State Grand Lake #5	12/20/39	64.80	7/64	33.7	8,075
GUEYDAN (Vermilion Pr.)	Magnolia Petro. Corp.	Adam Cormier #2	10/17/39	97.44 Dist	1/4	61.0	7,356
HAPPYTOWN (St. Martin Pr.)	Shell Oil Co., Inc.	Discovery well Iberville Land Co. #1	11/20/39	1,013.04	1/4	39.3	10,000
IBERIA (Iberia Pr.)	The Texas Co.	Duhe #11	11/1/39	148.50	Open	22.7	3,777
	The Texas Co.	J. P. Duhe et al #12	11/6/39	437.40	1/4	24.7	3,644
	J. J. Hooper	B. W. Marston #1	11/14/39	53.94	3/16	20.8	902
	William Helis	Bolivar #10	12/2/39	405.00	1/4	24.1	3,538
	The Texas Co.	J. P. Duhe et al #13	12/9/39	469.80	1/4	24.9	3,746
	Lisbon Iberia Oil Corp.	Gulf Fee #8	12/21/39	442.48	1/4	24.0	3,905
	William Helis	J. E. Schwing #8	12/22/39	49.62	Open	21.7	895
	The Texas Co.	J. E. Schwing #3	12/23/39	574.80	1/4	32.3	9,462
	William Helis	Bolivar #11	12/27/39	121.44	1/4	21.7	877
IOWA (Calcasieu Pr.)	Shell Oil Co., Inc.	F. Heyd #29	11/14/39	385.92	1/4	25.9	4,460
	Shell Oil Co. Inc.	F. Heyd #30	12/17/39	88.44	1/8	25.9	4,470
JEFFERSON ISLAND (Iberia Pr.)	The Texas Co.	Jeff. Salt Mng. Co. #3	11/1/39	777.60	1/4	35.5	7,914

Oil and Gas Wells Completed in South Louisiana During 4th Quarter of 1939

Field	Name of Company	Name of Well	Date Completed	Daily Initial Production	Size Choke (Inch)	Gravity	Total Depth
JENNINGS (Acadia Pr.)	Shell Oil Co. Inc.	Conover Community #7	10/9/39	593.76	14/64	36.6	7,698
	Iles Petro. Co. Inc.	Jennings Heywood Iles #2	10/12/39	80.40	Pumping	23.0	1,320
	Stanolind Oil & Gas Co.	Crowley O. & M. #115	10/30/39	377.64	7/32	33.5	7,639
	Port City Oil Co. Inc.	Jennings Heywood #25	12/1/39	180.00	3/8	26.6	3,000
	Shell Oil Co., Inc.	Conover Community #8	12/19/39	380.70	12/64	38.9	7,452
LAFITTE (Jefferson Pr.)	The Texas Co.	Rigolets Coop. Fur Co. #11	10/5/39	771.84	1/4	38.2	10,235
	The Texas Co.	Leo. A. Marrero #4	12/15/39	690.00	1/4	36.8	10,303
	The Texas Co.	LLE Lafitte #14	12/20/39	706.00	1/4	36.5	10,086
LAKE LONG (Lafourche Pr.)	Fohs Oil Co.	State Lake Long #11	12/13/39	170.00	12/64	38.1	10,195
LAKE PELTO (Terrebonne Pr.)	The Texas Co.	State Lake Pelto #27	10/12/39	451.70	16/64	27.1	5,285
	The Texas Co.	State Lake Pelto #28	12/10/39	342.00	1/4	33.5	5,490
LA PLACE (St. John Baptist Pr.)	Pan American Prod. Co.	Discovery well Hy. H. Chaffe (Mill) #1	11/25/39	138.00 Dist	1/4	62.3	10,175
LEEVILLE (Lafourche Pr.)	The Texas Co.	LLE Leeville #72	11/30/39	13.00	3/16	56.0	6,874
NORTH CROWLEY (Acadia Pr.)	Humble Oil & Rfg. Co.	J. B. Stokes #2	10/3/39	113.61	1/8	37.0	9,173
	Humble Oil & Rfg. Co.	F. Williams #6	10/19/39	405.36	3/16	36.5	7,199
	Humble Oil & Rfg. Co.	R. C. Davis #2	11/28/39	218.76	3/16	36.0	8,204
	Humble Oil & Rfg. Co.	H. J. Thevis #2	12/16/39	828.00	1/4	35.0	8,810
PARADIS (St. Charles Pr.)	The Texas Co.	LL&E Paradis #2	11/28/39	862.00	1/4	37.9	11,169
PORT BARRE (St. Landry Pr.)	Gulf Refg. Co.	Wilson Cocbran #15	10/12/39	742.00	1/4	33.8	5,116
	Pan American Prod. Co.	H. P. Garland et al #5	11/17/39	596.52	1/4	37.4	5,080
QUARANTINE BAY (Plaquemines Pr.)	Gulf Refg. Co.	Orleans Levee Dist A-5	10/2/39	758.48	1/4	34.7	8,594
	Gulf Refg. Co.	La. State QQ #15	11/7/39	649.00	1/4	34.4	7,721
	Gulf Refg. Co.	Plaquemines Land Co. A-3	11/28/39	349.00	11/64	35.8	8,178
	Gulf Refg. Co.	La. State QQ #14	12/19/39	925.00	1/4	35.3	8,196
SOUTH JENNINGS (Jeff. Davis Pr.)	Stanolind Oil & Gas Co.	Dan Doberty #1	12/13/39	180.56	1/4	46.6	9,700
UNIVERSITY (East Baton Rouge Pr.)	William Helis et al	Williams #2	10/5/39	220.00	11/64	35.8	6,479
	William Helis et al	Materiste #3	10/8/39	284.00	11/64	36.0	6,475
	William Helis et al	Duplantier A-6	10/10/39	292.00	11/64	35.3	6,480
	William Helis et al	L.S.U. A-4	10/11/39	248.00	11/64	36.0	6,489
	T. G. Markley & Crosby Drlg. Co.	Knox, Amiss & F #7	10/13/39	373.00	12/64	36.0	6,484
	M. T. Grubb	College Town Sub Div #2	10/24/39	350.00	12/64	36.0	6,495
	William Helis et al	Duplantier B 3	10/25/39	243.00	10/64	36.1	6,500
	W. V. Bowles & Co.	Richard Community #2	10/27/39	140.00	12/64	36.2	6,522
	William Helis	Materiste #4	10/30/39	240.00	11/64	36.1	6,472
	T. G. Markley & Crosby	Knox Amiss & F #3	11/1/39	341.00	12/64	36.0	6,477
	Albert J. McDonald	McDonald Community #1	11/1/39	228.00	9/64	36.1	6,488
	William Helis et al	L.S.U. #5 A	11/10/39	190.00	10/64	36.1	7,248
	Texas Canadian Oil Co.	Bogan Davidson Com. #1	11/12/39	140.00	9/64	36.1	6,497
	T. G. Markley & Crosby Drlg. Co.	Community #2	11/21/39	356.00	12/64	36.1	6,484
	W. V. Bowles & Co.	University Hills #3	11/21/39	200.00	12/64	36.0	6,508
	William Helis et al	Nelson #6	12/3/39	384.00	11/64	35.1	6,475
	W. V. Bowles & Co.	University Hills #2	12/12/39	115.00	9/64	35.8	6,516
	Lisbon Iberia Oil Corp.	College Town #A-2	12/21/39	312.00	13/64	36.1	6,526
	William Helis et al	Duplantier C-1	12/23/39	235.00	11/64	36.0	6,504
	Lisbon Iberia Oil Corp.	University Hills #2	12/25/39	312.00	10/64	36.0	6,498
VALENTINE (Lafourcbe Pr.)	Pan Ameri. Prod. Co.	Harang et al #21	10/7/39	450.00	10/64	32.9	5,427
	William Helis et al	Valentine #5	11/2/38	315.00	16/64	38.6	7,845
VENICE (Plaquemines Pr.)	Tidewater Associated Oil Co.	Buras Levee Dist. #6	12/7/39	293.00	1/8	39.5	10,741
VILLE PLATTE (Evangeline Pr.)	Continental Oil Co.	J. E. Vidrine Tr. 2 #3	10/3/39	257.00	3/16	40.2	8,971
	Continental Oil Co.	Ludeau Haas #6	10/15/39	168.00	3/16	58.8	9.093
	Continental Oil Co.	A. M. Fontenot #5	11/1/39	343.20	3/16	40.0	9,057
	Continental Oil Co.	A. M. Fontenot #4	11/1/39	318.00	3/16	38.3	9,030
	Continental Oil Co.	A. Coreil #2	11/3/39	136.94	3/16	40.8	10.360
	Continental Oil Co.	Oscar Pitre #4	11/4/39	216.00	3/16	40.3	9,020
	J. K. Hughes Oil Co.	J. E. Ortego #1	11/8/39	713.80	1/4	38.7	10,300
	Continental Oil Co.	J. E. Vidrine Tr. 11 #1	11/10/39	160.00	3/16	65.2	9,077
	Continental Oil Co.	Opelousas St. Landry #5	11/11/39	352.00	3/16	40.4	9,045
	Continental Oil Co.	N. H. Hirsch #4	11/15/39	480.00	1/4	39.6	9,062
	Continental Oil Co.	Philip Fontenot #2	11/23/39	744.00	1/4	40.6	9,084
	Continental Oil Co.	August Attales #2	11/29/39	265.20	1/4	41.0	8,980
	Continental Oil Co.	Martha Haas #4	12/7/39	606.00	1/4	41.0	9,050
	Continental Oil Co.	Adam Tract 10 #3	12/31/39	453.60	1/4	41.6	9,020
WEST HACKBERRY (Cameron Pr.)	The Superior Oil Co.	Benson Vincent #7	11/11/39	10.00 Dist	8/64	59.0	7,350
	The Superior Oil Co.	Benson Vincent #8	12/29/39	275.40	11/64	39.1	7,664
WHITE CASTLE (Iberville Pr.)	Shell Oil Co., Inc.	Baist Cooperage #1	11/25/39	623.00	16/64	27.0	6,449
WOODLAWN (Jeff. Davis Pr.)	Union Sulphur Co.	Raymond Hebert #1	10/6/39	63.84	1/4	51.0	9,575
	The Union Sulphur Co.	O. Miller #3	11/20/39	930.00	1/4	35.8	8,867
	Union Sulphur Co.	E. A. Norton #1	12/20/39	235.41	14/64	36.5	9,400

Oil and Gas Wells Completed in North Louisiana During 4th Quarter of 1939

Field	Name of Company	Name of Well	Date Completed	Daily Initial Production	Size Choke (Inch)	Grav-ity	Total Depth
COTTON VALLEY (Webster Pr.)	Geo. B. Barham	D. W. Merritt #1	8/19/39	24.84	Open	50.2	5,952
	Hassie Hunt	Gardner et al #1	9/24/39	30.48	Open	50.0	5,894
	Stanolind Oil & Gas Co.	Pardee #3	10/7/39	759.00	1/4	43.8	8,606
	Geo. Barham	Bodcau Lbr. Co. #1	10/12/39	430.56	1/4	45.0	5,863
	Hunt Oil Co.	Glass et at #1	10/12/39	364.32	1/4	49.0	9,042
	Midstates Oil Corp.	Coyle #1	10/29/39	408.60	22/64	42.8	8,711
	Oliphant Oil Corp.	Fred Banks #2	12/5/39	273.24	8/64	45.0	8,567
	Hassie Hunt	Holloway Davis #1	12/22/39	170.00	1/4	50.5	5,902
GEORGETOWN (Grant Pr.)	Arrow Drilling Corp.	Maxwell #1	10/3/39	20.00	Pumping	.....	1,537
LISBON (Claiborne Pr.)	E. T. Oakes & H. A. Shadrup.	T. H. Lloyd #1	11/22/39	648.00	5/64	33.3	5,330
	E. T. Oakes & Harry Standrup	Sallie Lloyd #1	12/24/39	792.00	16/64	..	5,343
MONROE (Morehouse Pr.)	United Carbon Co.	Tulsa Plt. Fee #2	10/10/39	4¼ MCF*	......	..	2,280
	United Carbon Co.	Tulsa Plt. Fee #3	11/14/39	6 MCF	......	..	2,290
	Southern Carbon Co.	Tensas Delta #26	10/23/39	1½ MCF	......	..	2,200
MONROE (Union Pr.)	Memphis Nat'l Gas Co.	Lankford #2	9/25/39	½ MCF	......	....	2,198
	We Hope Oil & Gas Co.	Frost Lbr. Ind. #4	9/26/39	1 MCF	......	..	2,208
	Nemours Corp.	G. W. Haile #4	10/7/39	2 MCF	......	..	2,201
	Memphis Nat'l Gas Co.	Frost Lbr. Ind. #1	10/16/39	2¼ MCF	......	..	2,200
	We Hope Gas & Oil Co.	Frost Lbr. Ind. #5	10/17/39	1½ MCF	......	..	2,220
	Memphis Nat'l Gas Co.	Lankford #3	10/23/39	1 MCF	......	..	2,160
	Southern Carbon Co.	Grayling #33	11/2/39	3 MCF	......	..	2,200
	H. L. Woods, Trustee	Frost Lbr. Ind. #1	11/6/39	1½ MCF	......	..	2,195
	Memphis Nat'l Gas Co.	Frost Lbr. Ind. #2	11/6/39	1½ MCF	......	..	2,165
	Memphis Nat'l Gas Co.	C. E. Day #1	11/21/39	1½ MCF	......	..	2,200
	Interstate Nat'l Gas	Mary E. Lee #1	11/21/39	2¼ MCF	......	..	2,205
	We Hope Gas & Oil Co.	Frost Lbr. Ind. #6	11/25/39	2 MCF	......	..	2,222
	Memphis Nat'l Gas Co.	Frost Lbr. Ind. #3	12/4/39	½ MCF	......	..	2,204
	H. L. Woods, Trustee	Union Power #1	12/5/39	2 MCF	......	..	2,212
	Southern Carbon Co.	Grayling #34	12/12/39	2½ MCF	......	..	2,220
	Memphis Nat'l Gas Co.	Frost Lbr. Ind. #5	12/14/39	½ MCF	......	..	2,204
	Interstate Nat'l Gas Co.	Brown Est. #1, W #96	12/18/39	1¼ MCF	......	..	2,202
	Memphis Nat'l Gas Co.	Taunton #1	12/22/39	1½ MCF	......	..	2,204
	We Hope Oil & Gas Co.	Frost Lbr. Ind. #8	12/28/39	1 MCF	......	......	2,220
RODESSA (Caddo Pr.)	V. A. Hardin (Scout Oil Co.)	Glassell-Means #1	10/17/39	168.00	Open	......	6,115
	Sultana Drlg. Co., Inc.	B. H. Bain et al #1	11/24/39	87.00	1/2	41.5	6,054
	M. M. Travis & Red Iron Drlg. Co.	Chandler #1	12/8/39	630.00	1/4	43.9	6,150
SHREVEPORT (Caddo Pr.)	C. H. Lyons et al	Rosenblath #1	11/6/39	202.08	16/64	......	5,999
	R. E. Allison Drlg. Co.	Ellerbe et al #3	11/17/39	198.00	3/16	......	5,563
URANIA (La Salle Pr.)	Smith Brothers	E. H. Kenney #1	11/14/39	35.00	Open	21.0	1,531

* MCF—As used in this table for convenience, means—Million Cubic Feet of Gas.

MANY SPECIES OF WILDLIFE INCREASING

Ever since America was settled we have been tragically shortsighted in the way we have treated our wildlife and wasted our natural resources. Now we are waking up, but in too many cases we are waking up to late.

A couple of centuries ago the Great Lakes, especially Lake Erie, were teeming with fresh water sturgeon. Fishermen, who were in quest of cisco, pike or perch, considered sturgeon a nuisance, and frequently when they become entangled in their nets, these fish were hauled ashore and burned like so much cordwood.

Then somebody discovered sturgeon roe could be made into caviar, and that the flesh of the fish was excellent. Following this discovery the sturgeon became the subject of a campaign of exploitation which has almost no parallel in conservation history. This went on until the species was practically wiped out. Today if a sturgeon is caught in Lake Erie, it rates newspaper comment.

Looking at a less gloomy side of the picture, grouse, sage hen and prairie chicken seem in no immediate danger of being eliminated from the American scene. True, in the past they were slaughtered ruthlessly and declined rapidly, but in these cases, man woke up in time. Today all the states in which these birds live have some measures of protection. In addition, 18 states have embarked on restocking campaigns for these birds made possible by federal funds allotted under the Federal-Aid-to-Wildlife Act.

Going further up the optimistic scale, we observe the pintail duck. Here is a good example of rehabilitation.

Almost every one is familiar with the jolt the nation got about six years ago when it was believed that ducks were on their way to oblivion. Widespread draining of nesting areas plus overshooting had all but wiped out migratory waterfowl. Frantically the sportsmen appealed to the United States to do something about the situation.

Uncle Sam did something—he gave the Biological Survey increased appropriations which enabled it to buy suitable lands and improve them for duck sanctuaries and refuge areas. In addition, the states began to take a hand. Regulations on hunting were tightened and game laws were enforced. Conservation-minded Citizens of the land held their breath. What would happen? Could the pintail and other ducks be saved?

Slowly the duck population began to rise. And it kept on rising. Today through the combined efforts of the Bureau of Biological Survey, The National Wildlife Federation, the various state conservation departments, and interested private parties, the ducks are coming back.

True, they are nowhere near as abundant as formerly, but at least, they have been saved and are on the increase.

Of all the species of ducks, the pintail is next to a most numerous. It is the principal duck of the Pacific flyway, and is a much sought after game bird. So much so, in fact, that Biological Survey field men and California state game wardens must be constantly on the alert to guard against the market duck shooter who infests the Sacramento rice fields and attempts to shoot the birds for unlawful sale.

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STATE OF LOUISIANA
126 Civil Courts Bldg., New Orleans, La.

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Reader Interest in the Review

From time to time we receive letters from our readers containing expressions of interest and approval of our magazine, Louisiana Conservation Review. While these expressions are not solicited they are none the less appreciated. At best the Editor's job is not an easy one—anything that helps to compensate for his "trials and tribulations" should be a source of inspiration for his continued effort.

Many of these letters are received from former residents of the State, who have moved to other sections of the country and welcome each issue of the Review as an old friend from "back home." Other letters are received from scholars and scientific institutions in foreign countries as well as our own, who follow with keen interest the experiments and investigations of the Department's research workers and other scientific agencies.

We invite constructive criticism or suggestions for the improvement of our magazine. We should also be advised of any changes in address, etc.

Armadillos Invading Louisiana

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"It is realized that the armadillo in its insect-feeding habits is not particularly solicitous concerning crops in the vicinity of which or on which insects may be feeding, yet it is true that this unusual animal is largely insectivorous and under most of its feeding conditions is doing beneficial work."

Experiments carried out in trapping the animal reveal that armadillos are not apparently attracted by a bait of eggs. One area of twenty acres where seven quail nests were located showed that only one nest had been disturbed by the numerous armadillos present and this evidently by accident. One individual observed destroyed eighteen ant colonies within a brief time. Armadillos roam widely, chiefly at night, although when hungry they have been observed hunting during daylight. Where they are numerous enough to damage lawns seriously by their burrowing, the best control method is hunting with dogs. Dogs will usually leave both fox and coon trails to follow in preference armadillos. The smooth-scaled armor of the armadillo's legs and its exceptionally powerful muscles enable them to escape from ordinary spring traps.

Armadillos exhibit an extraordinary breeding behavior since they normally produce identical quadruplets. These young, derived from a single egg, though usually four in number, may vary from identical triplets to identical octuplets. The young when born have open eyes and a soft armor, flexible as fine leather. Thereafter the skin hardens into a bony shell.

The Maya Indians of Yucatan have a legend that the vulture changes, in old age, into an armadillo. Its wings disappearing, its feathers lost, the metamorphosed vulture enters a burrow and begins its new life.

All available evidence indicates that sportsmen need not be alarmed at the appearance in Louisiana of this odd-looking animal whose industrious destruction of insects, particularly of the fire ant, is highly beneficial.

Additional confirmatory experiments are now being conducted by the Department of Conservation.

Information from sportsmen or nature students throughout Louisiana giving further observations on the distribution or activities of the armadillo will be received with appreciation by James Nelson Gowanloch, Chief Biologist of the Bureau of Research, Department of Conservation.

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Few Birds Live Past 10 Years, Banding Records Show

That any wild bird living more than 10 years is an old one is indicated by the bird-banding records of the Bureau of Biological Survey, United States Department of the Interior. In fact, when individuals of some species of small birds are more than 6 years old they are generally thought to have lived longer than most of their feathered relatives.

Recently the Survey received information that a 14-year-old herring gull had been found dead near Manistique, Mich., on September 27. The bird had been banded as a juvenile in July 1925 at St. James, Mich.

This record is among the few received recently of birds whose life span was more than a decade.

Twenty-one years is the greatest longevity record thus far recorded for any bird in the banding files. An osprey banded at Gardiner's Island, N. Y., in June 1914 was found dead at the same place in June 1935. One of the oldest birds recorded in the past few years was a 17-year-old Louisiana heron, which was banded at Avery Island, La., in August 1920 and retrapped at the same place in January 1937. No information about this bird has been received since that time, so whether the aged heron still wings its way over the Louisiana bayous is not known.

Some 14-year-old birds noted since 1937 include a purple grackle banded at Paoli, Pa., in 1924 and found dead at Upper Darby, Pa., in 1938; a mallard tagged near Peruque, Mo., in 1923 and shot in Saskatchewan in 1937; a red-tailed hawk banded in Saskatchewan in 1924 and killed at Ethel, La., in 1938; and a crow banded in Manitoba in 1924 and killed at Sherman, S. Dak., in 1938.

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Pelicans in the London Zoo are being conditioned to a meat diet because of the shortage of fish due to war conditions, the Bureau of Fisheries reports.

* * *

Apparently people who go fishing never get to jail, reports to the Bureau of Fisheries indicating that records of one penal institution reveal that among its inmates not one had fishing as a hobby.

MR. and MRS. JOHN Q. PUBLIC

And We Do Mean YOU—

You are cordially invited to visit the Museum of the Department of Conservation at 239 Royal Street.

Here you will see a splendid exhibit of our wildlife and natural resources, probably the most varied and interesting of any state in the Union.

This exhibit includes many fine specimens of the taxidermist's art. The Department's staff of skilled taxidermists is regularly employed in casting, mounting and preserving representative examples of our Louisiana fish and game species.

Native Louisianians will be proud of the extent and variety of our natural resources; out-of-state visitors will be enchanted by this easily accessible side-trip in the heart of *America's most interesting city.*

The Museum is in charge of Miss Rita Candilora who is assisted by Miss Bertha Mouille, Miss Rose Liuzza and Mrs. O. H. Simpson, librarian. Lectures are delivered at regular intervals by Mrs. Estelle V. Cottman, acting director of the Department's Bureau of Education, and competent guides are always at hand to explain the character of the various specimens. Scientists, scholars and school children are especially welcome.

The Museum is open daily from 9 a. m. to 4 p. m., except holidays.

You should take advantage of this invitation to spend an hour that will prove educational as well as entertaining.

DEPARTMENT OF CONSERVATION
NEW ORLEANS, LA.

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ERNEST S. CLEMENTS, Commissioner